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A Place for Wildlife

A discussion paper prepared for the Alberta
Conservation Strategy Project

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A Place For Wildlife

Prepared by
Renewable Resources Sub-Committee
Public Advisory Committees
to the Environment Council of Alberta

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Environment Council of Alberta
8th Floor Weber Centre
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T6H 5P9

Phone (403)427-5792

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FOREWORD

In late 1985, the Public Advisory Committees to the Environment Council of Alberta began working toward a draft conservation strategy for Alberta. The Public Advisory Committees (PACs), comprising representatives of some 120 non-government organizations, are in many ways an ideal organization for developing a strategy that should touch the lives of all Albertans. The PACs bring together many diverse viewpoints, we are non-partisan, and we have members from across the province. Since the early days of the project, we have welcomed non-PAC participants, and have been delighted to receive the contributions of civil servants, industry spokespeople, academics, and the general public.

We have made progress since 1985: the *Prospectus for an Alberta Conservation Strategy* has been published and many meetings and workshops have been held. The principle of a conservation strategy increasingly has been endorsed by Albertans, and Alberta has been recognized across Canada as a leader in conservation strategy development. There have been important related events. For example, in September of 1987, every environment minister in Canada endorsed the final report of the National Task Force on Environment and Economy, which recommended that conservation strategies be in place in every province and territory by 1992. This same report was endorsed by the First Ministers at their November, 1987 meeting.

We will have a conservation strategy for Alberta, we hope by 1990. Our work continues in the expectation that all those who are interested will have a chance to contribute to the project, through public hearings or some other public participation process.

Since the publication of the *Prospectus*, the PACs have concentrated on preparing sectoral discussion papers. The Conservation Strategy Steering Committee determined early on to produce background papers on relevant sectors, such as agriculture, fish and wildlife, tourism, oil and gas, and others. These discussion papers look at the issues within each sector, but, more importantly, they investigate the interaction of each sector with the others. Their preparation has involved consulting with a wide range of interest groups — a conservation strategy principle in action — which has proven fruitful in developing ideas about the ultimate conservation strategy. These discussion papers will be used as background information for drafting a conservation strategy document and, perhaps, in the future, in public hearings on the draft conservation strategy. This report is one in the series of discussion papers.

Because there are as many opinions on our best future direction as there are Albertans, we welcome comments. The conservation strategy will be only as good as the work that goes into preparing it. Please address any comments on this discussion paper or others in the series to the Environment Council of Alberta at the address given on the page opposite. I would also encourage you to make your opinions known at public hearings or other events as they are held. Let's treat Alberta as if we plan to stay!

Joan Snyder

Joan Snyder
Chairperson
Conservation Strategy Steering Committee
Public Advisory Committees to the Environment Council of Alberta

ABOUT THIS DISCUSSION PAPER

Among the objectives of the Alberta Conservation Strategy are those of preserving biological diversity and using our natural resources on a sustainable basis. This discussion paper examines the management of Alberta's wildlife in relation to these objectives and offers some suggestions for improving the management of this valuable resource. Development of Alberta's many natural resources has created growing pressure on wildlife populations and habitat. The need for bold objectives and a more holistic approach to managing our landscape is outlined in this paper.

ACKNOWLEDGEMENTS

A wide variety of people have contributed to this paper, ranging from interested lay people to experienced wildlife managers. Valuable comments were received from reviewers for the Alberta Wilderness Association; Alberta Fish and Game Association; Canadian Society of Environmental Biologists; Alberta Forestry, Lands and Wildlife; and the Canadian Wildlife Service. Many private individuals also reviewed the draft, and we thank them for the information they contributed. They include Bill Brown, Lyle Fullerton, Val Geist, Martin Paetz, Bill Phillips, Joan Snyder, John Thompson, Cliff Wallis, and Jack Wooders. Louise Horstman contributed substantial time, effort, and material to this paper.

A special meeting was held at the Environment Council of Alberta on November 14, 1988 to help focus this paper on the crucial issues in wildlife management. We are most grateful to Bob Andrews, Dave Buchwald, Jim Butler, Doug Culbert, Bill Fuller, Gerry Kemp, Archie Landals, Brent Markham, Dave Neave, Bob Stevenson, Hugh Wallis, and Bill Wishart for their participation.

Special thanks go to the dedicated staff in Alberta Fish and Wildlife and the Canadian Wildlife Service for their patient responses to inquiries. In particular, we drew upon the time and expertise of Peter Boxall, Daryl Empson, Margo Pybus, Wayne Spenser, Ernie Stenton, and Bill Wishart.

Many thanks as well to the ECA staff for their support and contributions. Brian Free assisted in co-ordinating input to this paper and wrote some of the material. Margaret Hughes typed the manuscript and Susan Morrow, Elaine Kaiser, and Anita Meek did the editing and final production.

Statements made in this paper may not represent the opinions of the contributors listed above and remain the responsibility of the Renewable Resources Sub-Committee.

Maryhelen Posey, Chairman
Renewable Resources Sub-Committee

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Chapter One

Wildlife in Alberta: An Overview

Description of the Resource

For many years, the term "wildlife" has been applied to wild birds and mammals found in our natural surroundings. Today this concept is changing, as people recognize the critical importance of habitat and the full mix of plant and animal species. At the 1982 Wildlife Ministers' Conference, it was agreed that the concept of wildlife should be expanded to include habitat (Federal-Provincial Wildlife Conference Committee 1982). More recently, Canadian wildlife managers have been considering a definition of wildlife that includes all wild plants and animals (B. Andrews 1989: pers. comm.). This broad definition is well suited to the objectives and principles of the Alberta Conservation Strategy project and is used in this discussion paper.

Each of the biophysical regions of Alberta — grassland, parkland, boreal forest, montane, and alpine areas — has a distinctive climate, soil, and biological past. The result is a mosaic of habitats that supports a wide variety of plants and animals. Alberta is home for at least part of the year to about 90 species of mammals, 250 species of breeding birds, 50 species of fish, 10 species of amphibians, and 8 reptile species (Alberta Fish and Wildlife Division 1984). This assemblage of animal species has several special characteristics:

- Despite the province's relatively small size, our large mammal resource — moose, elk, deer, bighorn sheep, mountain goat, caribou, antelope, black bear, grizzly, cougar and others — is sufficiently diverse and abundant to be the envy of many other provinces and countries.
- For many of the prairie and parkland animal species, Alberta is the northernmost part of their range in North America. Examples include the sage grouse, badger, bobcat, and short-horned lizard.
- Alberta's prairie potholes and parkland lakes provide breeding habitat for a significant portion of North America's waterfowl.
- A variety of trout and other fish species inhabit Alberta's mountain lakes and foothill streams, but cold water temperatures and short summers limit growth and productivity.

Thousands of species of invertebrates are found in the province. They are the base for many food webs in both aquatic and terrestrial environments. As well, some are decomposers essential to the recycling of nutrients, others are pollinators essential to the reproduction of native and agricultural plants, and others are predators that maintain the balance of species in the insect community. The ecological role of many of the invertebrate species in Alberta is not yet known.

About 1,900 plant species are native to Alberta, and many other wild and domestic species have been introduced to the province. Reflecting the range of altitude and latitude in the province, plant communities as diverse as northern bogs, prairie badlands, aspen forest, and alpine meadows are found.

Trends in Habitat and Populations

Adequacy of the Information Base

Experienced biologists who are familiar with an area and the animal species can produce comprehensive habitat assessments. Utilizing such expertise, staff of the Fish and Wildlife Division of Alberta Forestry, Lands and Wildlife have developed critical wildlife area maps covering most of the province. These maps identify areas known to have high concentrations of certain species, important **ungulate** winter range, waterfowl nesting areas, and similar critical habitats. To be effective, these maps must be updated periodically with current information. The degree to which this is done varies from region to region depending on the workload and priorities of field personnel. In order to assess trends in wildlife populations and habitat, it is fundamental to conduct ongoing inventories to determine densities, productivity, and limiting factors. Decreased funding has limited the amount of inventory data obtained in recent years.

Ungulate — hoofed mammal. In the context of Alberta wildlife, this includes antelope, deer, moose, elk, caribou, mountain goats, and bighorn sheep.

We have historically paid the most attention to game species because ungulates are popular prey of both sport and **subsistence hunters.** Annual hunter surveys provide information about these game populations. Populations of ducks, geese, and other migratory game birds are monitored by federal, provincial, and American wildlife agencies. For some of the furbearing species, trapping records indirectly measure population levels. However, many factors that affect trapping effort, such as current market prices, must be taken into account.

Subsistence hunters — hunters who rely on wild game for much of their food.

The occurrence and distribution of game fish species is known for most of the province, although data on actual population sizes are limited. Regional Fish and Wildlife Division staff spend some of their time surveying fish populations and habitat. **Creel censuses** and commercial fishing records provide information about user demand and harvest. Most of Alberta's lakes have been surveyed to collect basic information about habitat — lake depth, water quality, and species present. Less information is available about river habitat, which is more complex and which changes over the length of the river. Alberta Environment contributes some information through fisheries studies done for water management projects and related planning activities.

Creel census — a count of fish captured by anglers .

Information on non-game species is much more limited. The Alberta Bird Atlas, a major project of the Federation of Alberta Naturalists, will provide wildlife managers with their first comprehensive database about non-game bird species, such as songbirds, shorebirds, and birds of prey. World Wildlife Fund Canada has sponsored a survey of reptiles and amphibians in the grassland and aspen parkland regions as part of the Wild West Program (Cottonwood Consultants Ltd. 1986). Flowering plants and animal species have been inventoried for some of Alberta's parks, ecological reserves, and natural areas.

With respect to wildlife habitat, there are several sources of information. In the early 1970s, surveys were conducted as part of the Canada Land Inventory. A series of maps was prepared, identifying habitat capability for waterfowl, ungulates, furbearers, and sport fisheries. For some species, such as ungulates and furbearers, this information is very outdated, as forest cover and land use have changed markedly over the years. For waterfowl and fisheries, these maps still provide some useful information, although more recent data are needed.

Alberta's ecoregions, which reflect climate, vegetation, and soil differences (see Strong and Leggat 1981), provide a good background for evaluating wildlife habitat. Further refinement into smaller subdivisions (ecodistricts) is underway. For the forested part of the province, detailed inventories of timber resources have been completed.

Most of these maps focus on biophysical features of the landscape. To properly manage wildlife, we must relate these biophysical features to animal numbers and needs. Familiarity with the ecology of the species is important. What factors limit the animal populations in a certain area? Is there sufficient cover or food? Does road access create excessive hunting pressure or human disturbance? More ecological research is needed to complement the biophysical information.

Changes in Habitat

The flora and fauna of Alberta are not what they were a century ago, largely because much of the original habitat has been transformed. This is especially true for the prairie ecoregion, where cultivation, cattle grazing, and wetland drainage have all but eliminated certain grassland ecosystems. Today, only about 20 percent of the original native grasslands remains in the three prairie provinces (World Wildlife Fund Canada n.d.). Much of the aspen parkland has been cleared of trees to accommodate agricultural crops, domestic livestock, and human settlement. In Alberta, only 5 to 10 percent of the original aspen parkland region remains intact (North 1976 cited in Rowe 1987a). Canadian Forces Base Wainwright contains the largest block of undisturbed parkland in the province.

Beyond the prairie ecoregions, the transformation of the landscape has until recently been less profound. In the boreal forest, timber harvesting has an important influence on wildlife habitat. Coal mining, oil sands development, exploration for fossil fuels, and agricultural development have also made inroads into the boreal forest.

Timber harvesting is also a factor in the mountain ecoregions. Oil and gas exploration and development, domestic grazing, and intensive recreation are other pressures on the natural habitat. Old growth forest and sensitive alpine meadows are perhaps the most threatened mountain ecosystems.

Within the province's large biogeographical regions, smaller landscape features that are important to local wildlife are also threatened. Woodlot removal, wetland drainage, intensive grazing, and stream bank trampling contribute to this degradation of local habitat. Dams on rivers flood **riparian** habitat, block fish migration routes, and alter the downstream flow regime. At the same time, new reservoirs create habitat for some species of fish and other animals.

Riparian — pertaining to the banks of rivers, streams, lakes, etc.

Changes in Plant Communities

As habitat is modified or eliminated, characteristic plant species disappear. For example, altered flow regimes below dams are threatening the riparian cottonwood forests of southern Alberta (Bradley 1987). About one-quarter of the native plant species in the province are rare, threatened, or endangered (Alberta Forestry, Lands and Wildlife n.d.a). In Alberta's prairie and parkland wetlands alone, there are 16 rare plant species (Bradley 1987). Some of these species are found outside of Alberta and are not facing extinction. However, their loss from Alberta diminishes the richness of the wildlife we enjoy. In addition, when one plant species is lost, many other plant and animal species may be affected.

Changes in Animal Populations

As human settlement spread throughout the province, some species, such as magpies and whitetail deer, benefitted, but others declined. Animals of native prairie and parkland communities were most affected because much of these regions is now cultivated. As a result, a number of prairie species are now rare or in danger of disappearing from Alberta. These include the burrowing owl, ferruginous hawk, and swift fox. Already believed to be gone from the province are the greater prairie chicken, black-footed ferret, and the yellow- or chestnut-cheeked vole (Alberta Fish and Wildlife Division1985).

In the last 20 years, North America's waterfowl populations have seriously declined, especially the pintails and mallards. Figures 1a - b illustrate this decline in southern Alberta. Duck numbers have fallen as nesting cover is lost, wetlands are drained, and habitat used during migration disappears (Environment Canada and USDI 1986). Draining potholes and sloughs and altering adjacent nesting cover has concentrated ducks and their predators into such small patches of habitat that populations of some duck species cannot be maintained. Mallards and pintails of the Canadian prairies and midwestern United States are at their lowest levels since first surveyed in 1955 (Environment Canada and USDI 1986). Populations of geese, on the other hand, are generally stable or increasing, with some exceptions. Some geese populations have benefitted from agricultural practices, and some have responded well to management projects.

In other regions of the province, several species are declining. Grizzly populations face increasing human intrusions into wilderness areas. Species that depend on old growth forest, such as woodland caribou and marten, are threatened by timber harvesting. Mule deer have also recently declined, due mainly to loss of habitat (Alberta Fish and Wildlife Division 1984).

The outlook for some species is quite good. Beaver are relatively abundant and whitetail deer and coyote have benefitted from agricultural expansion. Some species once considered endangered, such as the white pelican, double-crested cormorant, and wood bison, have gradually been increasing in number.

Alberta has 29 species of hawks and owls. The ferruginous hawk and burrowing owl are considered threatened and the peregrine falcon is endangered. Great horned owls and red-tailed hawks are very common, but the status of many

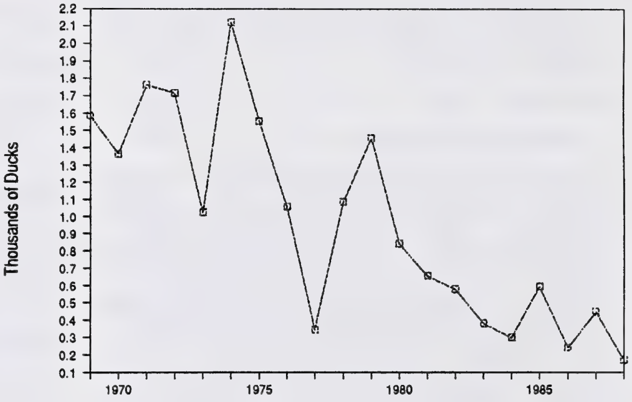

Figure 1a. Changes in Pintail Population

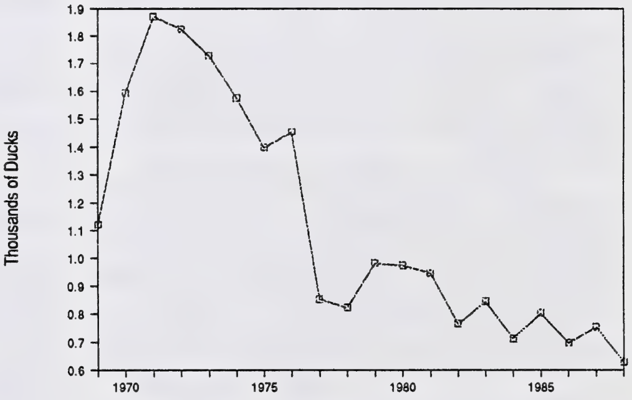

Figure 1b. Changes in Mallard Population

Source: Canadian Wildlife Service. (Unpublished data) other raptor populations is unknown. The Alberta Bird Atlas project should provide valuable information about these and other bird species.

The status of many species, especially nongame animals, is unknown. Little is known about the distribution and habitat of the province's reptiles and amphibians, although six species are reported to be rare or declining in abundance (Cottonwood Consultants Ltd. 1986). There has been a decline in most species of wild trout and char in the province as a result of both fishing pressure and habitat degradation (Alberta Fish and Wildlife Division 1984). Walleye is another species that is declining and lake trout are being overfished in many watersheds (Pearse 1988). There is a growing reliance on stocking waterbodies with hatchery fish to satisfy anglers' demands.

Because pressures from resource developments and human intrusions into critical habitat will continue to grow, greater effort will be needed to reverse the decline of the species mentioned above. More and better inventories and further research on the effects of habitat manipulation will be required if wildlife managers are to have the tools necessary to maintain Alberta's diverse wildlife resource.

Chapter Two

Economic and Social Significance

We derive many benefits from wildlife, from meeting basic survival needs to recreational and commercial opportunities. These benefits may have different values to different cultures and individuals. Assessing the value of wildlife is therefore a difficult task. Nevertheless, all of these benefits represent a continually self-perpetuating wealth. Unlike resources that are exported and eventually depleted, the wildlife resource, given adequate protection, is relatively stable and provides its benefits mainly in the location in which it exists.

Measuring the Value of Wildlife

The wildlife industry is a multi-faceted, job-intensive industry based mainly on services. It includes both commercial and non-commercial uses of wildlife. Commercial uses include commercial fishing, trapping, fur farming, game farming, fish farming, and game bird farming. Other commercial activities that depend on wildlife include taxidermy, guiding and outfitting, and fly-in fishing operations. Non-commercial uses are primarily recreational.

Some of the value of wildlife is measured by transactions in the marketplace. The monetary value of recreational uses and the associated commercial industries, such as guiding and outfitting, far exceeds that of the retail trade in wildlife products. For example, the wildlife industry in North America is a $63 billion business, whereas the worldwide retail trade in wildlife parts is valued at $5 billion (Geist 1989).

But only a portion of the value of wildlife is expressed in the commercial marketplace. The principles of resource economics provide some useful methods for assessing the non-market value of wildlife. A hunter may value the hunting experience above and beyond the money expended for equipment, travel, accommodation, and so on. This "extra-market" value is also important. One method of determining this value is to directly question people and determine how much they would be willing to pay, say, to have an extra day of hunting. One British Columbia study examined this extra-market value (also referred to as consumers' surplus) for hunters and found it to be substantial (Table 1). While spending an average of $57 per day to hunt moose, hunters estimated that the experience was worth on average an additional $30* per day to them (Wildlife Branch 1985). Waterfowl hunters spent an average of $29 per day and indicated that they would be willing to pay an additional $15.60 for the experience (Wildlife Branch 1985). This suggests that the value of wildlife to the recreationist is much more than the actual expenditures involved.

Non-use or preservation value includes the value we attach to wildlife even though we don't "use" it. This includes:

- option value – the value of maintaining the resource so that it will be available for future use. Being able to hunt certain species or visit an unspoiled wilderness area at some future time has value to many people.

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* 1981 dollars

- existence value – the value of knowing that the resource exists. Even though an individual has never seen a whooping crane, that individual may experience a significant loss should that species become extinct.
- bequest value – the value of providing the resource for future generations (Phillips and Adamowicz 1986).

These are also extra-market values and can be estimated by determining willingness to pay or accept compensation. Although it is not appropriate to quantify all intangible values of wildlife, it is useful to apply monetary values to some of the benefits of wildlife that are not in reality bought or sold (National Task Force on Environment and Economy 1987).

Table 1. Value of Resident Hunting in British Columbia

Game Species	Average Expenditure (1981 $/day)	Average Consumers'Surplus (1981 $/day)
Mountain goat	163	33.40
Grizzly bear	125	42.60
Bighorn sheep	117	46.40
Black bear	78	17.90
Elk	61	30.50
Moose	57	30.00
Deer	52	23.70
Waterfowl	29	15.60
Upland game birds	16	13.10

Source: Wildlife Branch, B.C. Ministry of Environment 1985

Recreation Value

In 1981, a major survey was conducted to evaluate the importance of wildlife (excluding fish) to Canadians (Filion et al. 1983). Results indicate that about 20 percent of Albertans went on a trip primarily to find wildlife and to watch, feed, photograph, or study it (primary non-consumptive trips). During that same year, about 11 percent of Albertans hunted, the main consumptive use of wildlife. Almost 90 percent of Albertans participated in indirect wildlife-related activities, such as watching films, visting zoos, and so on.

The economic benefits of hunting and primary non-consumptive trips were also measured. Participants spent about $550 million on such things as accommodation, transportation, food, equipment, memberships, and others (Filion et al. 1985). The survey indicated that Albertans were willing to pay an additional $114 million above and beyond actual expenditures in order to pursue these activities.

A study of sport fishing activity in 1985 shed some light on the value of fishing to the economy (Alberta Forestry, Lands and Wildlife and Fisheries and Oceans Canada 1988). Anglers in Alberta spent $132.5 million on costs directly related to fishing and invested another $162.2 million in property and major durables for sport fishing. This generated an estimated $442 million of direct economic activity in the province. Over 417,000 Albertans fished that year.

All of these (and other) studies indicate that Alberta's wildlife resource has considerable economic value. The presence of wildlife brings tourists to many local communities in Alberta. The town of Brooks receives an influx of hunters during the pheasant season, as does Wainwright for deer, and Medicine Hat for antelope. The annual expenditure for water-based recreation (primarily sport fishing) in Calgary's Bow River valley has been estimated at $2.22 million (Alberta Forestry, Lands and Wildlife n.d.b). Guided anglers in this area are mainly from the United States and contributed an additional $1.9 million to the provincial economy (Alberta Forestry, Lands and Wildlife n.d.b.).

Some communities also have the potential to benefit from non-consumptive use of local wildlife. Jasper, Banff, Canmore, and Waterton benefit from the tourism related to the mountain parks, of which viewing big game animals is a valuable part. Beaverhill Lake near Tofield and Lake Newell near Brooks are popular sites for viewing waterfowl.

Commercial Value

The commercial value of fish and wildlife is small compared to that of some other natural resources, such as oil or timber products. Fur trapping, fur farms, game farms, fish farms, and commercial fishing exploit commercial markets for animals and animal parts. Commercial collecting of amphibians and reptiles is also allowed. There are commercial activities indirectly related to these enterprises, such as taxidermy, guiding, and outfitting. The total estimated commercial value of fish and wildlife was $10.7 million for 1983 (Alberta Fish and Wildlife 1987). This does not include the value of meat obtained from hunting and trapping.

Commercial Trapping and Fur Farming

Many Albertans are involved in trapping. In 1987-88, there were about 8,600 licensed trappers. Over the past 10 years, income from the sale of pelts has ranged from over $15 million in 1979-80 to less than $6 million in 1983-84 (Alberta Energy and Natural Resources, annual reports). Many factors affect these revenues. Market prices are influenced by animal supply, fur quality, and consumer demand. Supply is affected by population cycles, habitat modification, weather, and predation.

Trapping is primarily a winter activity and provides seasonal income to trappers. Fur sales are very important to the income of some native communities. The predominantly native trappers in the Peace-Athabasca Delta earned over $1.6 million from muskrat pelts between 1973 and 1978 (Smith 1986).

The 45 registered fur farms that raise mink or fox in the province generated over $1.8 million in 1986-87 (Alberta Agriculture 1988). Attempts to raise other furbearers, such as lynx, coyote, ferret, and fisher have met with limited success. Chinchilla are also raised in 27 operations around the province.

Consumer attitudes toward fur trapping have a significant effect on the trapping and fur farming industry. This is especially true in the important European market. Highly emotional campaigns against the harvest of seal pups and against leg-hold traps have greatly reduced the market for fur. The Canadian government, the Fur Institute of Canada, and Indian associations have launched publicity campaigns to educate the public about trapping and its economic and cultural importance. Research on humane trapping methods is being conducted at the Alberta Research Council and through other research programs. Their focus is on padded leg-hold traps and quick-kill devices. Alberta Fish and Wildlife Division regulations stipulate acceptable trapping methods and a Trappers' Education Program promotes humane trapping and proper fur handling and marketing. Whether these programs will ensure a secure future for this industry remains to be seen.

Game Bird and Big Game Farms

Pheasants are raised on game bird farms by hobbyists and small commercial operators. Ring-necked pheasants are the most common species, although some breeders raise chukar, bobwhites, and gray partridge. Most of the game bird farms are small operations (fewer than 100 birds per year), where the birds are raised as a hobby (D. Moyles 1989: pers. comm.). A few commercial operations raise up to 15,000 pheasants annually, selling live birds to shooting grounds and meat to food stores. In 1987-88, there were 438 game bird farms and 25 registered pheasant shooting grounds in Alberta.

There are currently 80 big game farms in Alberta (B. Stevenson 1989: pers. comm.). About 2,500 domestic elk, 300 deer, and 50 moose are found on these farms. The main value of these animals is as breeding stock. In 1988, a cow elk was valued at $9,000 to $10,000, a heifer calf at $5,000, and a bull calf at $2,500 (B. Stevenson

1989: pers. comm.). Antler velvet is also sold at about $60 to $80 per pound ($135 to $176 per kg). A bull elk may produce about 20 pounds (9 kg) of velvet per year.

Raising elk for profit is a relatively new agricultural industry. The proposed sale of meat from big game ranches has spurred a heated public debate. Arguments range from the philosophical to the economic. Some argue that elk are better adapted to Alberta conditions than domestic cattle and make better use of natural forage. Elk ranches would therefore require less modification of natural habitat. Others express concern that a new commercial market for venison would stimulate an increase in poaching of wild animals. Transmission of disease from domestic to wild populations, more pressure for predator control, and other related concerns have been raised. Some people object to the very concept of privatizing wildlife.

Commercial Fishing and Game Fish Farms

In 1987-88, there were 2,380 commercial fishermen in the province. The 2,841 tonnes of fish harvested generated $3.15 million (K. Zelt 1989: pers. comm.). Whitefish was the most important commercial species, contributing about 80 percent of the revenue. Other species included walleye, northern pike, tulibee, ling cod, lake trout, perch, and suckers. Commercial markets for walleye and pike are improving. A new market for northern pike has opened up in France (K. Zelt 1989: pers. comm.). However, competition with sport fishing for our limited fish stocks could pose problems in the future.

In the 1960s, interest in raising game fish on private property for sport and commercial gain led to regulations that provided for game fish farming in Alberta. Currently there are 1,634 private game fish farm licences that permit the raising of game fish for recreational and personal use, and 60 commercial licences that permit the raising of game fish for commercial purposes. Rainbow trout are the most common species raised and they are sold to private fish farms for stocking.

Guiding, Outfitting, and Fly-In Fishing

An important tourist industry is based on recreational hunting and fishing. People who come to Alberta to hunt big game are required to hire an Alberta guide. Outfitting these hunting parties is a profitable business and brings money into the Alberta economy. There are 326 guiding and outfitting operations in Alberta (B. Stevenson 1989: pers. comm.).

Fly-in fishing lodges operate on northern lakes and attract mainly Alberta anglers fishing for lake trout, walleye, and northern pike. In 1985, six fly-in fishing lodges generated approximately $530,000 in total receipts (O. Voaklander 1989: pers. comm.). There are currently 12 fly-in fishing lodges in Alberta as well as about 20 tent camps (O. Voaklander 1989: pers. comm.).

Trout fishing in the foothills attracts many anglers from the United States. A study of the Bow River trout fishery in 1986 revealed that 10 guides or guiding companies were operating in the Calgary area (Alberta Forestry, Lands and Wildlife n.d.b). Total spending by these guided fishing parties was $2.7 million or $2,265 per guided angler.

Subsistence Values

Many Albertans hunt and fish both for sport and to provide meat. Many a freezer is stocked each fall with ducks, geese, grouse, and venison. For some, this meat is an important source of protein, not a luxury item. Native communities especially depend on fishing, hunting, and gathering to meet their food requirements.

A dual economy is operating in many native communities today. A market economy including wage employment, fur sales, and social assistance exists alongside a subsistence economy based on fishing, hunting, trapping, and gathering (Bodden 1981). For native people, subsistence living satisfies not only basic survival needs such as food and clothing, but also cultural values. Although outside influences have led native people in Alberta away from pure subsistence living, it is still a significant way of life to many.

The value of wildlife resources used by natives in the province has not been calculated. In the northern Alberta community of Little Buffalo, native residents eat moose, deer, fish, waterfowl, grouse, beaver, and muskrat, and they feed bear, hare, beaver, muskrat, and fish to their dogs (Bodden 1982). In a study of natives living near the Slave River Delta, Northwest Territories, not far from the Alberta border, the replacement value of such "country food" was found to exceed the value of fur sales (Bodden 1981). (Replacement value was based on the value of the most comparable domestic meat (chicken, beef, etc.) available in local retail stores). Country food and fur sales together accounted for 35 percent of the community's total income.

Future Demand

The nature of the demand for the wildlife resource appears to be changing. As the number of outdoor recreation options has grown in recent years, hunting and fishing are no longer the only outdoor activities Albertans pursue. Compared to the mid-1970s, a smaller percentage of Albertans are buying hunting licenses, and a smaller proportion of young people are being recruited to the sport (Boxall and Smith 1986). Even so, hunting pressure has increased steadily over the past several decades, due to population growth in the province (Glasgow 1982). The number of non-Canadian hunters in Alberta declined between 1974 and 1984 (Boxall 1986), but increased during the mid-1980s (Alberta Fish and Wildlife Division 1987).

In spite of the apparent relative decline of hunting popularity with residents, the demand continues to exceed a decreasing supply in many areas and for many game species, including the highly popular ducks, pheasants, and partridge, and moose and antelope. Unless the supply can be increased, further limitations on the hunting of many species can be expected.

The popularity of sport fishing is on the increase. Of the over 417,000 Albertans who fished in 1985, almost 30 percent were children (Alberta Forestry, Lands and Wildlife and Fisheries and Oceans Canada 1988). Although stocking programs, fish hatcheries, and trout ponds are being developed throughout the province, the fish resource is not keeping up with the demand. As a result, further limitations must be imposed to maintain the resource; for example, only catch and release is now allowed on the North Ram River. Many of the lakes in the populated parts of the province are small and experience heavy fishing pressure. More restrictions on sizes taken and catch and possession limits are likely in the future.

A recent study describes the tourism potential of wildlife in Alberta (Prism Environmental Consulting Services 1989). Alberta's black bear and goose populations attract out-of-province hunters to Alberta and could support increased hunting. Many other species are attractive for non-consumptive activities, such as viewing. These include bison, pronghorn antelope, bighorn sheep, grizzly bear, sage grouse, pelicans, and trumpeter swans. The study also identified seven areas of the province with potential for wildlife-related tourism (Figure 2). Most of these areas support a variety of wildlife species and are easily accessed by tourists.

Interest in wildlife has grown and encompasses a broad range of species. Volunteer efforts to increase knowledge about many of the province's lesser known species and natural areas have expanded greatly in recent years with the help of government funding. As the general public becomes more informed, it is likely that appreciation and demand for protection will increase.

Figure 2. Areas With High Wildlife Tourism Potential

Peace River (1)

- wildlife opportunities combined with scenic river trips
- boreal species such as moose, mule deer, black bear
- migrating and nesting waterfowl

Grand Prairie/Saskatoon Lake (2)

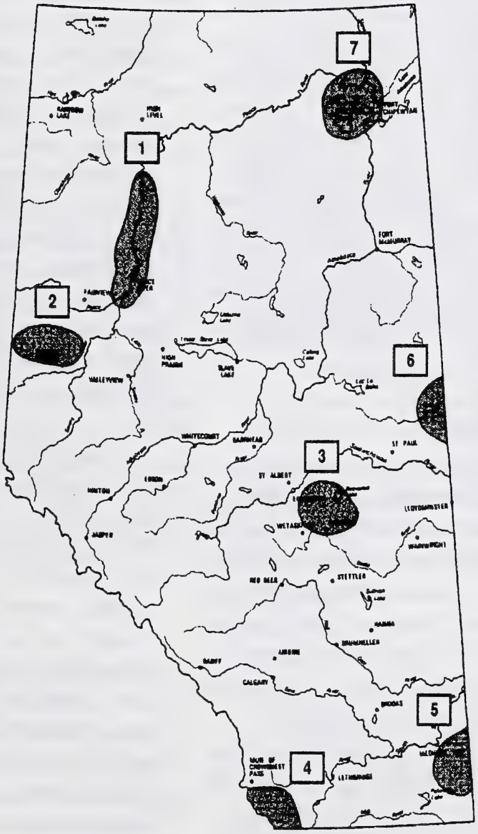
- adjacent to Highway #2
- migrating and nesting Trumpeter Swans

Beaverhill Lake/Elk Island National Park/Cooking Lake-Blackfoot Grazing Wildlife and Provincial Recreation Area (3)

- offers a wide range of wildlife opportunities
- over 250 species of birds
- both sub-species of bison
- large number of elk and moose
- adjacent to Highways #16 and #14

Waterton Lakes National Park (4)

- over 220 species of birds
- large numbers of migratory waterfowl
- 10 species of large mammals
- large wintering herd of elk



Fort Chipewyan (7)

- wilderness experience
- free-ranging bison
- waterfowl migration and nesting
- Peace-Athabasa Delta

Cold Lake (6)

- variety of colonial nesting species such as western grebe, pelicans, cormorants
- notable passerine migration along western shore
- bald eagle migration along Martineau River

Cypress Hills/Walsh Flats (5)

- near Trans-Canada Highway
- over 200 species of birds
- interesting historical and geological features
- large populations of elk, deer, and some moose
- large wintering population of antelope along Trans-Canada Highway

Adapted from: Prism Environmental Consulting Services 1988

Chapter Three

Managing The Wildlife Resource

Who Has Jurisdiction?

Our native wildlife is a public resource and as such is managed by government on behalf of the public. A number of federal and provincial government agencies are involved, some directly and others indirectly. The provincial government, specifically, the Fish and Wildlife Division of the Department of Forestry, Lands and Wildlife, is largely responsible for managing wild populations, with certain aspects of management being shared with the federal government, as described below. Management of native plant populations has largely been ignored until very recently except in the national parks.

Wildlife Populations

The provincial Wildlife Act is the primary legislation governing wildlife management in Alberta (excluding fish). The Act outlines general rules for hunting and establishes enforcement procedures and penalties. The Act also establishes the Fish and Wildlife Trust Fund to finance habitat protection and enhancement projects, provide compensation for property or crops damaged by wildlife, and to promote humane trapping methods.

Regulations under this Act pertain to either free-roaming or captive wildlife. The regulations define "wildlife" as native vertebrate animals, including mammals, birds, amphibians, and reptiles, but not fish. Some introduced species are included in this definition, such as gray partridge and ring-necked pheasant. Domestic animals and pets are excluded from the Act and all other species are "exotics."

Other provincial legislation addresses the management of "problem" wildlife — primarily wildlife that comes into conflict with landowners or agricultural operations. For example, the Water Resources Act authorizes the removal of beaver dams. The Agricultural Pests Act establishes two categories of vermin: pests and nuisances. Landowners may control nuisance species using methods outlined in the regulations to this Act (for example, open season, bounties, trapping, etc.). Coyote, skunk, ground squirrel, English sparrow, and magpie are examples of recently designated nuisance species. Pest species are considered a more serious problem; landowners *must* take steps to eradicate these animals. Examples of pests are the Norway rat, grasshopper, and warble fly.

The authority to conduct research on species of national importance and to assist provinces with wildlife conservation is conferred upon the federal government by the Canada Wildlife Act. The Canadian Wildlife Service of Environment Canada carries out federal responsibilities with respect to wildlife, focusing primarily on migratory birds and endangered species. Management of wildlife on federal lands, such as national parks, Indian reserves, and military reserves, is also a federal responsibility under the Act. In national parks, wildlife management is part of the responsibility of Parks Canada personnel. The federal government can also acquire lands to support research and conservation of migratory birds and other wildlife, and is empowered to take measures to protect wildlife species in danger of extinction.

The management of migratory birds, which includes most bird species in Alberta, is a federal responsibility under the Migratory Birds Convention Act of 1917. Based on a convention between Britain (on behalf of Canada) and the United States to protect migratory birds, the Act provides for setting of seasons and limits on waterfowl hunting and joint American-Canadian management programs such as the North American Waterfowl Management Plan of 1986. It ensures an active role for the federal government in waterfowl management.

Fisheries management is a federal responsibility established by the Fisheries Act (Canada). The federal Cabinet can make regulations about the management and control of fisheries; conservation and protection of fish populations; catching, possession, and disposal of fish; and habitat protection, among others (Pearse 1988). However, the provincial government does most of the day-to-day administration of this Act. Alberta officials draw up the provincial sport and commercial fishing regulations, which are then passed into law by the federal government. The role in Alberta of the federal Department of Fisheries and Oceans is limited to inspections of fish processing and marketing operations. The Freshwater Fish Marketing Corporation markets all freshwater fish harvested in Alberta that are destined for commercial outlets, except those that commercial fishermen sell directly to local consumers.

Native Plants

Public interest in native flora is growing, as evidenced by the increasing popularity of spring wildflower counts, citizen movements to protect local areas having rare plant species, and people growing wildflowers in their gardens. Interested people established an Alberta Native Plant Council in 1987 for the purpose of preserving wild flora through education, research, and conservation actions.

It is not clear who should be managing native plants, or what management should entail. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), composed of federal and provincial representatives, includes plants in its review of endangered species and has established programs to protect them. In Alberta, there is no legislation governing endangered species or native plant management, although several provincial agencies are indirectly involved. The Department of Forestry, Lands and Wildlife includes several agencies involved in plant management. The Alberta Forest Service is responsible for forest management, with trees being the main focus of interest. The Natural Areas program of the Public Lands Division includes plant protection among the criteria for selection of candidate natural areas. For example, the Wagner Natural Area near Edmonton contains a natural bog with several rare orchid species. Unlike the United States, where native plants are considered to be wildlife and protection of rare plants is assigned to the wildlife agencies, Alberta Fish and Wildlife only manages plants as part of animal habitat. The Department of Recreation and Parks manages provincial parks, wilderness areas, and ecological reserves, some of which contain important plant populations. Nation-wide maps of rare plants are being published by the National Museum of Canada and the Provincial Museum of Alberta has published a checklist of rare vascular plants (Packer and Bradley 1984). Identifying these rare populations is the first step toward their protection and ultimately successful management.

Natural Habitat

Although wildlife agencies manage the wild animal resource, they do not control the land or water on which the wildlife depends. Various government agencies are responsible for managing different categories of public lands (Table 2). Co-operation between wildlife agencies and the land and water managing agencies is essential.

For the purpose of managing Alberta's resources, the government has divided Alberta's land base into two categories: the Green Area and the White Area (Figure 3). The Green Area is

Table 2. Public Land Management

Land Category	Management Agency
Green Area	Alberta Forest Service
White Area	Public Lands Division
Provincial Parks	Alberta Recreation and Parks
National Parks	Canadian Parks Service
National Wildlife Areas	Canadian Wildlife Service
Migratory Bird Sanctuaries	Canadian Wildlife Service
Wilderness Areas	Alberta Recreation and Parks
Ecological Reserves	Alberta Recreation and Parks
Natural Areas	Public Lands Division
Military Reserves	Canada Department of Defense
Crown Rights-of-Way	Municipalities, Alberta Transportation and Utilities

mostly forested and unsettled, and most of it is Crown land. The Alberta Forest Service manages this public land. The White Area is open to settlement and agriculture is the dominant land use. Much of the wildlife habitat in the settled area is privately controlled, further complicating the management of the public wildlife resource. The Public Lands Division of Alberta Forestry, Lands and Wildlife manages the Crown lands in the White Area.

The aquatic habitats on which fish depend also fall under a number of jurisdictions. Protection of fish habitat from disturbance and pollution is legislated under the federal Fisheries Act and is under the jurisdiction of the Department of Fisheries and Oceans. Environment Canada acts on behalf of that department with respect to the pollution provisions of this Act. Day-to-day administration of the Act is the responsibility of Alberta Fish and Wildlife Division staff who hold appropriate federal appointments.

Regulation of water pollution and streamflow use is the responsibility of Alberta Environment. Potential and real conflicts have arisen between strict enforcement of the Fisheries Act and this provincial regulatory mandate. Alberta Environment relies on its Clean Water Act for regulation and enforcement of water pollution. The federal government is careful not to infringe on provincial rights to manage natural resources and the Alberta Fish and Wildlife Division relies on Alberta Environment to deal with most pollution issues. Thus the powerful provisions of the Fisheries Act are seldom brought into play.

This constitutional quagmire has made water and fisheries management complicated and often inefficient. In a review of the management of Canada's freshwater fisheries, Pearse found "a fragmented system of overlapping responsibilities among agencies which do not appear to be mutually supportive; indeed they often conflict" (Pearse 1988: 48). He called for a clarification of responsibilities, objectives, and strategies for achieving them.

The main pieces of legislation governing wildlife management reflect a traditional view of wildlife management, focusing primarily on game species and allocating the wildlife resource among different users. More legislative direction regarding wildlife conservation is needed. Alberta's Historical Resources Act recognizes the value of our human heritage, but conservation of our wildlife heritage has little direct support in our current legislation. A Wildlife Conservation Act would offer an important boost to wildlife conservation in Alberta. It should include a meaningful definition of wildlife that includes all wild animals and plants. An Endangered Species Act has also been proposed (and would receive considerable public support) to protect species in danger of being extirpated from our province. However, when new species are added to the list of threatened or endangered species, this constitutes a failure to properly manage our wildlife heritage. Endangered species programs are last-ditch attempts to correct grave shortcomings in our wildlife management system.

Special Management Areas

Crown lands in Alberta may be assigned to a number of categories, some of which have specific benefits for wildlife. These include national and provincial parks, ecological reserves, wilderness areas, Willmore Wilderness Park, natural areas, forest land use zones, provincial and forest recreation areas, national wildlife areas, and migratory bird sanctuaries. Approximately 68,700 square kilometres, or 10.4 percent of Alberta's land base, falls into these classifications (Swinnerton in press). These areas have varying degrees of protection and, although some multiple use is usually allowed, they are generally kept in a natural state and therefore benefit local wildlife. Their value to wildlife varies according to the restrictions placed on access and resource developments and how they are managed. Several of these special categories are described below.

National and Provincial Parks

There are five national parks in Alberta (Wood Buffalo, Elk Island, Jasper, Banff, and Waterton Lakes) covering a total area of 54,084 square kilometres, about 78 percent of protected lands in Alberta. With the exception of the smaller Elk Island National Park (194 km^2), these are all large areas that protect a diversity of wildlife habitats. Natural processes are generally allowed to operate without interference. Except for native hunting and trapping in Wood Buffalo National Park, consumptive use of wildlife is prohibited. The primary objective of national parks is to set aside representative examples of each of the natural regions in Canada and to protect the associated flora, fauna, and other natural phenomena in perpetuity. As such, national parks are important refuges for both representative and rare or endangered species of wildlife that face continuing habitat loss across the country. In addition to the general protection under the National Parks Act, which precludes extractive activities such as mining, logging, and similar industrial activities, most of the land within the national parks is zoned to protect the environment. Relatively small areas are devoted to towns and other visitor facilities.

Provincial parks in Alberta cover 1,251 square kilometres. Although one of the stated objectives of the Provincial Parks Act is to maintain them for the conservation and management

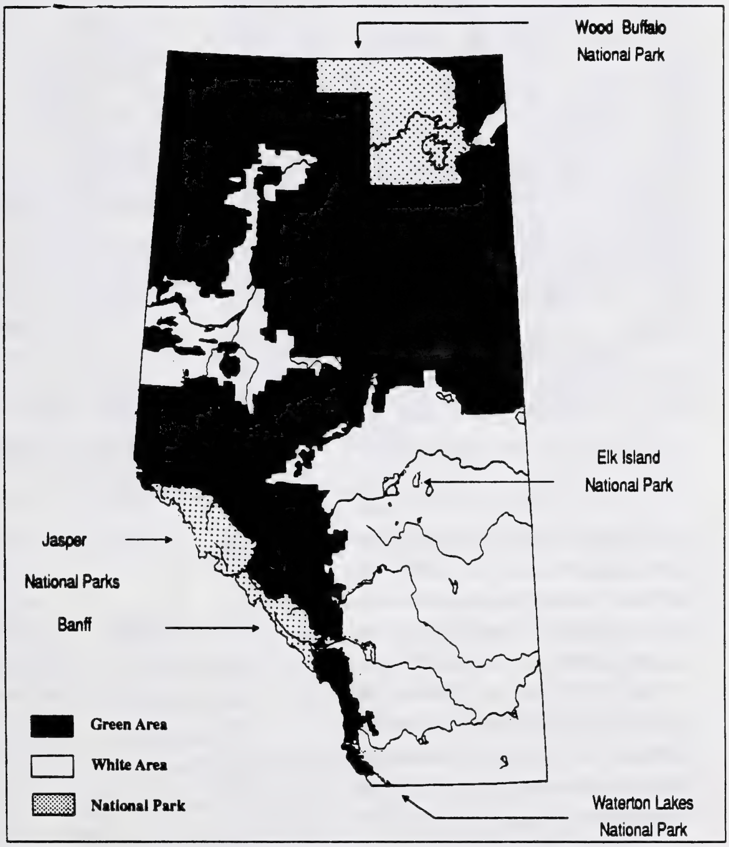


Figure 3. The White and Green Areas

Source: Government of Alberta

of flora and fauna, most of the parks are small and largely fulfill a second objective: to be used and enjoyed for outdoor recreation. A number of provincial parks, such as Dinosaur, Writing-On-Stone, and Cypress Hills, are important to wildlife conservation because they protect badlands, prairies, and other environments not included in the national parks system. Even the smaller parks that are geared largely toward outdoor recreation contain pockets of habitat that support local wildlife and provide opportunities for viewing and nature appreciation.

Wilderness Areas and Wilderness Parks

Three wilderness areas have been established under the Wilderness Areas, Ecological Reserves and Natural Areas Act: the White Goat, Siffleur, and Ghost River Wilderness Areas. These three wilderness areas have the highest degree of legislated protection in Alberta. All industrial and extractive activities, as well as hunting, fishing, and the use of horses and motorized vehicles, are prohibited. These areas are true wildlife sanctuaries; however, they likely protect little that is not well represented in the mountain national parks.

Willmore Wilderness Park (4,597 km^2) to the north of Jasper National Park has its own legislation. Although the use of motorized vehicles is prohibited, hunting, fishing, and the use of horses are permitted. This area has a reasonable degree of protection. The Act does not preclude mineral development; however, these activities are currently not allowed under the Eastern Slopes Policy. Willmore is probably of greater value to wildlife than the three wilderness areas because of its larger size and greater diversity of habitats.

Wildlife Sanctuaries

There are three National Wildlife Areas (NWA) and four Migratory Bird Sanctuaries (MBS) in Alberta (Table 3a). Their value for wildlife varies. Hunting, fishing, trapping, and some agricultural activities may be permitted, depending on the management strategy. Some of these areas received their designation when other federal departments declared these lands to be "surplus" (Jurick 1985). Others were found to have special value as wildlife habitat and were thus established as sanctuaries. Two of the bird sanctuaries, Calgary's Inglewood MBS and the Red Deer (Gaetz Lakes) MBS are part of a city parks system and are heavily used by city residents. They are more valuable for outdoor education and nature studies than as wildlife habitat. A university research station and federal geomagnetic observatory are located in the Meanook NWA. The Blue Quills NWA near St. Paul is used as an outdoor classroom, but is also important to local waterfowl, especially during periods of drought (Jurick 1983).

Spiers Lake NWA, north of Hanna, is one of the few sites of undisturbed rough fescue grassland in the park and grassland transition zone (Jurick 1983). Canada geese breed there and its saline wetlands attract many types of shorebirds. There are two large migratory bird

Table 3a. National Wildlife Areas (NWA) and Migratory Bird Sanctuaries (MBS) in Alberta

Name	Area (ha)	Location
Blue Quills NWA	98	near St. Paul
Meanook NWA	214	south of Athabasca
Spiers Lake NWA	64	northwest of Hanna
Inglewood MBS	160	Calgary
Red Deer MBS	130	Red Deer
Richardson Lake MBS	12,725	south of Fort Chipewyan
Saskatoon Lake MBS	1,135	west of Grande Prairie

sanctuaries in the northern part of the province. Saskatoon Lake MBS near Grande Prairie is an important staging area for geese, swans, and other waterfowl as well as a breeding site for the rare trumpeter swan. It also contains a provincial park that attracts many recreationists, which in turn diminishes its value as a sanctuary (Jurick 1985). The Richardson Lake MBS is located in the Peace-Athabasca delta and provides breeding, molting, and staging habitat for waterfowl. The water level of Richardson Lake was affected by the construction of the Bennett Dam in British Columbia, to the detriment of the waterfowl populations (Jurick 1985).

Several kinds of sanctuaries have also been established under the provincal Wildlife Act. Hunting of wildlife is forbidden in the Sheep River Wildlife Sanctuary and no hunting of game birds is permitted in the seven Game Bird Sanctuaries (Table 3b). There are also Restricted Areas (42 lakes and 7 rivers), where game bird hunting is restricted during part of the hunting season. Seven seasonal sanctuaries protect cormorant and pelican colonies by prohibiting access to colony islands and adjoining waters during the nesting season.

Table 3b. Provincial Wildlife Sanctuaries (WS) and Game Bird Sanctuaries (BS)

Name	Location
Sheep River WS	east of Lougheed Provincial Park
Birch Lake BS	near Innisfree
Lac La Biche BS	at Lac La Biche
Many Island Lake BS	east of Medicine Hat
Ministik Lake BS	southeast of Edmonton
Miquelon Lake BS	southeast of Edmonton
Pakowki Lake BS	west of Manyberries
Richardson Lake BS	south of Fort Chipewyan

Military Reserves

Three of Alberta's federal military reserves preserve large tracts of relatively undisturbed habitat. The Cold Lake Air Weapons Range (5,200 km^2) is located in the boreal forest, CFB Wainwright (400 km^2) is in the aspen parkland, and CFB Suffield (2,600 km^2) is in the shortgrass prairie ecoregion. Apart from a special hunting season for the Wainwright reserve, access to these areas is very much restricted. The Suffield reserve is especially valuable because there are few other large tracts of undisturbed prairie.

Ecological Reserves

Since 1981, eleven ecological reserves ranging in size from about 8 to 38 km^2 have been created in the province under the Wilderness Areas, Ecological Reserves and Natural Areas Act. Ecological reserves are selected and designated to protect representative examples of Alberta's ecological zones or to preserve rare and unique species and natural features. Although the Act essentially precludes competing land uses, cattle grazing to mimic wildlife grazing and hunting to prevent game populations from exceeding the carrying capacity of the reserve are allowed. Given the small size of most reserves, they are valuable primarily to smaller species that do not need extensive habitat.

Natural Areas

Over 110 parcels of public lands totalling about 315 km^2 have been officially designated as Natural Areas and are managed by the Public Lands Division. These are selected on the basis of local importance for nature-oriented recreation or education. They are often as small as a section of land or less. Natural areas generally preclude agriculture and forestry; however, other activities such as oil and gas development and the use of off-highway vehicles are reviewed on an individual basis. Hunting is not forbidden, although the main use of natural areas is for non-consumptive nature appreciation. Since many natural areas protect pockets of habitat in otherwise developed rural parts of the province, they are of considerable local value for many species of wildlife.

Forest Land Use Zones

Under the Forests Act, areas of Crown land can be designated as forest land use zones. Regulations can then be established to limit activities. There are ten forest land use zones in Alberta, covering 5,643 square kilometres. They have been established primarily to restrict motorized vehicle use in sensitive terrain and so protect wildlife from these disturbances.

Critical Wildlife Zones

Alberta's Eastern Slopes Policy categorized public lands in the Eastern Slopes according to priority of uses such as agriculture, wildlife habitat, multiple use, and general recreation. This system has been extended to other areas for which Integrated Resource Plans have been developed. Critical Wildlife Zones are Crown lands essential to the welfare of important local wildlife populations. Although there may be other resource uses in these zones, wildlife has priority. This zoning system guides government resource managers who make decisions about land use on these public lands. Because these zones are based on policy and not legislation, the intent of the designation can be flexibly interpreted. This has led to controversy over the management of these areas. Many people feel that too much disturbance has been allowed in some critical wildlife zones.

History of Wildlife Management in Alberta

Management of the province's wildlife focused for many years on allocating the resource among consumptive users. Species that were hunted or caught for profit or pleasure were most important. This approach is reflected in the early name for the management agency, "Game Branch," which was in effect until the province's first Wildlife Act of 1970. Non-game species management consisted mainly of the pursuit of "vermin," an activity that began even before Alberta was a province: there was a bounty on wolves as early as 1899 (Wishart 1960).

Fish and game stocking began early in the province's history. The Banff fish hatchery was built in 1913 in response to declining trout populations (Paetz 1985). Rivers and streams were stocked first, but the hatchery fish had low survival rates. Stocking of lakes and ponds was more successful, and by 1985 hatcheries supplied as many as five million trout annually (Paetz 1985). Upland game birds, such as the gray partridge, ring-necked and Mongolian pheasants, and bobwhite quail, were introduced into the province through the work of fish and game clubs between 1908 and 1922 (Lewis 1979). Chukar partridge were introduced to southern Alberta in the 1930s. The last introduction of an upland game bird species came in the 1960s with the release of wild turkeys in the Cypress Hills.

Some big game species have also been transplanted. To replenish the disappearing bison, a protected herd was brought from Montana to Alberta in 1907 (Lewis 1979). Elk were imported from Yellowstone National Park in Wyoming to Jasper and Banff National Parks in 1917 and 1920 (Robbins et al. 1982).

The habitat needs of wetland species first became a concern with the drought of the Thirties, as sloughs and potholes began drying up. Waterfowl were first surveyed in 1935 across the western provinces, and in 1937 Ducks Unlimited Canada began to restore wetland habitat throughout these provinces. Habitat restoration and development received a boost from the Buck for Wildlife Program introduced in 1973. An extra fee added to hunting and fishing licences went specifically to this program, ensuring a minimum level of funding to protect some fish and waterfowl habitat.

The discovery of rabies in wild carnivores in northern Alberta in the early 1950s led to widespread government-sponsored eradication programs using trapping and poison bait. As a consequence, the fox population was decimated and has not regained its former size in the forested regions of the province. The wolf population has regained some of its pre-50s numbers (Alberta Fish and Wildlife Division 1984). Since the epidemic, skunks (another carrier of rabies) have been controlled in southern Alberta.

Limits on the number of animals harvested by hunters have fluctuated over the years, influenced by management philosophies, perceived population trends, and carrying capacity of the land. Until the 1960s, Alberta's forests were largely intact and large predators were relatively abundant. Ungulate populations were generally compatible with the carrying capacity of the land. However, predator eradication programs led to increasing ungulate populations. By the 1960s, the government initiated hunting seasons for antlerless (female) elk, moose, and deer in an attempt to reduce population sizes to better fit declining habitat capacity. This strategy was so effective that, in some locations, ungulate populations declined more than anticipated and this hunting season was discontinued.

The demand from hunters began to exceed the supply of prey and restrictions on horn and antler size were introduced to limit the number of males taken. Eventually, these trophy restrictions became ineffective in limiting the harvest sufficiently to maintain ungulate populations in areas where hunting pressure was very high. A lottery system involving draws for hunting permits was introduced to limit the number of hunters. In 1988, a draw was introduced for the first time for mule deer. The ultimate restriction on hunting, a total ban, has now been invoked for certain game animals, including mountain goats and woodland caribou.

Sport fishing regulations stipulate where, when, and how fish may be caught and limit the species, number, and, to some extent, the size of the fish that may be kept. Trout streams have been managed on a "fallow" system, whereby tributaries to larger rivers are open to fishing only in alternate years. This helps to keep enough mature trout in the streams to maintain natural reproduction.

As fishing pressure has increased, the daily catch limit has been lowered. During the 1960s, the limit was dropped from 15 to 10 trout and later to 5 trout from coldwater streams (Paetz 1985). Stocked lakes and ponds have higher catch limits. "Trophy lakes" with low bag limits and special angling licences were introduced in 1970 in an attempt to maintain a high-quality fishery for large lake trout and northern pike in selected lakes.

Recent Management Approaches

Many of the approaches used in the past to manage populations are still in use today. Every year, government managers adjust harvest quotas to meet wildlife management goals. The number of animals to be taken by hunters, fishermen, and trappers is set and restrictions on the age or gender of the prey may be stipulated. Harvest regulations vary across the province; there are over 150 wildlife management units, 8 fisheries management units, and 8 fur management zones, each with their own quotas and restrictions. Catch-and-release fisheries have been established in some waterbodies. This allows fishermen to enjoy their sport with reduced impact on fish populations.

Transplants and reintroductions are still important tools. Fish hatcheries have been expanded to meet growing demand from sport fishermen. Elk from Elk Island National Park are transplanted to boost local elk populations. Pheasants are raised on game bird farms and released for the hunting season.

A recent approach to wildlife management is to focus on key species. The Alberta Fish and Wildlife Division is developing species management plans, primarily for game species and threatened or endangered ones. The Division sets population goals and outlines management strategies. Habitat management has a similar focus on key species whose local populations might be jeopardized by a proposed development. The Fish and Wildlife Division believes that providing for the needs of key species will also meet the needs of many other species associated with the same habitat. The requirements of each species must be well understood to ensure that these needs are met. Research on habitat requirements of non-game species has been limited and research budgets of provincial and federal wildlife agencies have been shrinking. More research on non-game species is needed.

Two approaches to habitat management are used: habitat protection and habitat enhancement. Some habitat is protected by restricting resource development and setting aside areas as parks or sanctuaries. Efforts in this direction have been somewhat limited, either by the lack of information or staff needed to make plans and assess applications, or by a reluctance to dedicate more land primarily to protecting wildlife.

Habitat enhancement involves modifying the landscape to benefit wildlife. Large projects to consolidate wetlands or create new ones have been undertaken in the prairie region to enhance waterfowl populations. Creating riffles and excavating pools in riverbeds enhances fisheries habitat. An extensive fisheries mitigation program has been planned for the Three Rivers dam on the Oldman River. To a lesser degree, terrestrial habitat, particularly vegetation cover, is being altered in pursuit of wildlife goals. Shelterbelts are planted in agricultural areas to benefit upland game birds and other species. Bulldozers, herbicides, and prescribed burning are used to control brush and enhance forage for elk in the foothills. Just as natural changes in plant communities result in changes in the associated animal populations, so wildlife managers are learning to manipulate vegetation to restore and enhance habitat for preferred species.

Greater co-operation is needed among government agencies, industries, and landowners to re-establish and protect habitat in Alberta. There are several examples of successful habitat programs. These illustrate the direction wildlife management must take in the future. These projects and programs involve shared goals and efforts of many government and non-government agencies, landowners, and sometimes industries. They are admirable examples of goodwill won by hard work, but they have also taken years to put in place. They have suffered from a major hindrance, namely, a lack of enabling government policy and legislation so they could be integrated into departmental policies. They have not been able to keep pace with other claims on the natural resources of Alberta and further improvements will be needed.

A brief description of some of these programs is given below.

Buck for Wildlife Projects

Financed by a surcharge on wildlife certificates and fishing licences, this program has, in the past 15 years, contributed $14 million worth of habitat enhancement projects. A similar program by which non-consumptive users could also contribute directly to wildlife conservation is needed. Suggestions include sale of a conservation stamp, a surcharge on sporting goods such as binoculars, or an income tax credit similar to those instituted many American states a decade ago. Although non-hunters can purchase the Resource Development Stamp that hunters attach to their licences, this opportunity to contribute to wildlife conservation is not effectively promoted by the government.

Ducks Unlimited Projects

Sportsmen in the United States and Canada fund this private organization, which has provided nearly $45 million to restore or improve over 1,000 wetlands (Ducks Unlimited Canada n.d.). The recent Wetlands for Tomorrow program of Alberta Forestry, Lands and Wildlife and Ducks Unlimited is developing 20 wetland areas, including the Tyrrell-Rush Lakes area south of

Lethbridge. The need to enhance upland nesting habitat near wetlands is a major focus of Ducks Unlimited's Prairie Care program. The program will offer financial incentives to farmers to convert marginal cropland to permanent cover, and conservation cropping and tillage will be encouraged. Land may be purchased under the program, to allow intensive waterfowl management.

Wildlife Habitat Canada Projects

Wildlife Habitat Canada is a private organization supporting habitat conservation projects and contributing to joint projects with other organizations. For instance, it funded the purchase of a 2,200 hectare block of prairie habitat near Brooks to be managed for waterfowl, deer, antelope, and upland game birds. The Alberta Fish and Game Association will manage the Antelope Creek property with revenue from the property's surface leases.

Co-operative Setting of Fish Harvest Limits

A system for allocating the fishery resource among all users has been in place since 1972. Commercial fisheries groups, regional government biologists, native groups, Chambers of Commerce, and the Alberta Fish and Game Association meet annually to set harvesting quotas among each group, as well as time and depth restrictions for commercial netting. For certain lakes, lake management committees have been created to address fisheries management problems.

The provincial Fisheries Policy, which assigns priority to domestic fishing and sportfishing over commercial fishing, has led to reduced catches for certain commercial operations. It is becoming more difficult to set commercial limits as some fish stocks decline and the demand continues to grow. A more thorough understanding of the numbers, distribution, and biology of Alberta's fish species will be needed as pressure on this resource increases.

American Waterfowl Management Plan (NAWMP)

This agreement between Canada and the United States is an attempt to manage innovatively — as opposed to simply limiting harvests — to restore waterfowl populations. The goal is to reverse the trend of duck habitat loss due to drainage of wetlands, and degradation of migration habitat, winter habitat, and nesting cover. The 15-year agreement to fund waterfowl habitat conservation programs should benefit Alberta farmers, as land use contracts will provide financial compensation for the setting aside of wetlands for waterfowl production. The NAWMP may also supply funds for seed and chemicals to ensure crop or stubble cover on **summerfallow** fields.

Summerfallow — cultivated fields that are periodically taken out of crop production.

Money from the NAWMP may be funneled into existing habitat programs. The Alberta Landowner Habitat Project (see below), Ducks Unlimited's Prairie Care program, and the Prairie Farm Rehabilitation Association's Permanent Cover Program are examples of programs being considered for NAWMP funding.

Alberta's first habitat project under the North American Waterfowl Management Plan is in the Buffalo Lake moraine area north of Stettler. Money from the NAWMP will be used to acquire land and provide nesting islands and upland nesting cover, as well as to fence against cattle and predators. Although this is the only NAWMP habitat project in Alberta to date, the NAWMP will support many more projects during the remaining 10 years of the agreement.

Landowner Incentive Programs

Programs enabling landowners to preserve wildlife habitat now exist across Canada and the United States: The Alberta Landowner Habitat Project, Ontario's Natural Heritage Stewardship Program, the Manitoba Habitat Enhancement Land Use Program, and Prince Edward Island's

Co-operative Watershed Management Project. All involve co-operation among a number of agencies such as Wildlife Habitat Canada, provincial natural resource departments, and non-governmental organizations concerned with wildlife. These programs offer options to the landowner, from foregoing production on areas of good habitat to integrating wildlife with agricultural production. Incentives vary accordingly, with direct payments compensating for options that preclude the opportunity to make a profit from the land. The cost of these programs is generally lower than direct purchase of the land (Wildlife Habitat Canada 1987).

The Alberta Landowner Habitat Project has been very successful in the three counties in which it now is operating. Although the Alberta government has announced that this program will be expanded to cover the entire province, funding for this expansion has not been secured. Without adequate funding, the program will not be effective.

Innovative Support for Wildlife Conservation and Research

As interest in wildlife has grown, more people are becoming involved in wildlife conservation. Many initiatives are coming from the private sector, including non-profit organizations, landowners, consultants, private companies, and individuals. Organizations like the World Wildlife Fund, Wildlife Habitat Canada, the Nature Conservancy, and the Canadian National Sportsman's Show are supporting wildlife research as well as the acquisition and enhancement of natural habitat. Landowners are dedicating parcels of land to natural habitat, and individual naturalists are contributing substantial time and effort to research projects.

Co-operative support for wildlife research has become more common. An example is the Greater Jasper Ecosystem Caribou Research Project on the decline of caribou populations in western Alberta and eastern British Columbia. More than just a caribou count, this project will also study the factors affecting population dynamics and provide practical information to decision makers. Funding for this project has come from a variety of private conservation and sportsmens' organizations, as well as both federal and provincial government agencies.

Another research project is focusing on cougars. Biologists are studying the productivity and mortality of radio-collared cougars in Kananaskis Country. The Sheep River Cougar Project is being funded by private individuals, private companies, hunting and conservation organizations, and government agencies.

Provincial Wildlife Policy

In 1982, the provincial government issued a policy to guide future management of fish and wildlife (Alberta Fish and Wildlife Division 1982). The Fish and Wildlife Policy for Alberta contains four policy statements: a Fish and Wildlife Outdoor Recreation Policy, a Wildlife Policy, a Fisheries Policy, and a Fish and Wildlife Regulatory Policy.

The stated goal of the Fish and Wildlife Division in its Outdoor Recreation Policy is to provide a variety of outdoor recreational opportunities based on fish and wildlife. The Division is currently developing a ten-year outdoor recreation plan to further define its role and objectives in this regard.

The Wildlife Policy and Fisheries Policy commit the government to protecting fish and wildlife populations from severe decline and ensuring that viable populations are maintained. In addition, the government is to meet projected demands for wildlife — both consumptive and non-consumptive — by increasing populations where necessary. The Minister must make a periodic statement about the status of these resources and how the government intends to deal with projected demands.

The first of these status reports, issued in 1984, estimated population sizes and trends and projected demands (Alberta Fish and Wildlife Division 1984). Based on the assumption of continuing demand trends, the Division has set species population goals. Thus, for example, moose are to be increased by 27 percent, whitetail deer by 6 percent, mule deer by 37 percent, and elk and lynx by 100 percent each (Alberta Fish and Wildlife Division 1984).

The Division developed a policy in 1985 for managing threatened wildlife species, with the goal of restoring populations to viable levels (Alberta Fish and Wildlife Division 1985). The policy assigns species at risk to management categories such as "endangered," "threatened," and "vulnerable," and strategies for each category are set forth (Table 4). An endangered species is in danger of extinction in Alberta within the next decade (Alberta Fish and Wildlife Division 1985). A threatened species will likely become endangered if conditions do not change, and vulnerable species will likely become threatened if their situation does not improve.

Table 4. Species at Risk

Endangered	Threatened	Vulnerable
peregrine falcon	burrowing owl	piping plover
whooping crane	ferruginous hawk	mountain plover
wood bison	woodland caribou	trumpeter swan
swift fox		white pelican

Various agencies have initiated programs to protect remaining populations of some of these species or reintroduce those that have been eliminated from the province. For example, Operation Burrowing Owl is intended to conserve these threatened prairie owls by locating existing breeding areas and educating landowners about their plight. A swift fox reintroduction program is underway in southern Alberta and Saskatchewan.

Interagency Co-ordination

The government agencies that manage Crown land often have little responsibility for protecting or managing wildlife or natural communities. While fulfilling their mandates to manage other resources, they often alter or eliminate wildlife habitat. This has particularly been the case when government priorities have placed economic development far ahead of conservation of natural lands and wildlife.

Examples of programs and policies that conflict with those of wildlife include:

- The commitment in the Eastern Slopes Policy to maintain a certain level of cattle grazing in the Rocky Mountain Forest Reserve impedes efforts to enhance forage and meet provincial government population targets for elk.
- Drainage projects that reduce the quality and quantity of aquatic habitats for waterfowl and other wetland species have been promoted by Alberta Agriculture and Alberta Environment. At the same time, Buck for Wildlife, Ducks Unlimited, and the North American Waterfowl Management Plan are pouring millions of dollars into saving prairie wetlands.
- The sale of Crown land for cultivation in the Special Areas of southeastern Alberta by Alberta Municipal Affairs reduces prairie wildlife habitat. World Wildlife Fund Canada, funded largely by industry, and the Alberta Fish and Wildlife Division are at the same time trying to save some of these lands.
- Cattle grazing on Crown lands sometimes trample and destroy streambank vegetation. Buck for Wildlife funds must be spent to fence streams and replant vegetation.

Because our wildlife agencies have no authority to manage the land or water on which wildlife depends, and have limited inventory information and staff resources, their influence on resource management is much less than is needed. Alberta's landscape needs to be managed with all uses in mind, including wildlife. Currently the components of the landscape — the land, the trees, the water, the wildlife — are managed by different government agencies. Although co-ordination among agencies has improved, an integrated authority to manage the landscape would better meet the needs of the wildlife resource.

The policy and planning framework for landscape management should be clearly set out. Such decisions should not be made by a single Minister, but by a Cabinet subcommittee or subcommittee of the Legislature. For example, in Ontario and Manitoba, Cabinet subcommittees deal with land use planning. These subcommittees have a support staff that analyzes issues and provides continuity over time. This multisectoral approach to solving landscape management problems would be better than having each sector developing independent approaches.

At the field level, the delivery of resource management programs could be improved. Resource management agencies such as the Alberta Forest Service, Alberta Environment, Alberta Fish and Wildlife Division, and Alberta Agriculture have different administrative regions, and field personnel for an area may be located in separate offices or even different towns. The creation of regional resource coordinators by Alberta Forestry, Lands and Wildlife is a step in the right direction, but further integration and co-ordination with other departments is needed.

Interdepartmental Referrals

A provincial interdepartmental referral system exists for taking into account the conflicting requirements of various government agencies. All agencies potentially affected by applications for grazing leases, timber licences, mineral leases, and water licences review these applications and may place restrictions on the licence to operate. Although Alberta Fish and Wildlife Division biologists participate in this system, the large number of applications and limited manpower available to review them often means the Division cannot participate adequately. They are forced to priorize these referrals and deal only with the most important ones. Without adequate participation, the system is ineffective.

Project proponents often suggest that wildlife disturbed by development will move into adjacent "equivalent" habitat. However, adjacent habitat cannot accommodate all of the displaced animals and there will be a net loss of wildlife. The cumulative effects of different projects must be considered.

Integrated Resource Planning

The interdepartmental review of applications is a reactive, project-by-project approach. The government instituted a more proactive approach to multiple use planning for Crown lands in 1976. In this integrated approach, interagency teams develop plans for resource management on Crown lands at regional, subregional, and local scales. Numerous plans are now completed or being developed. These plans guide government agencies that award leases or issue permits for resource development. They also indicate to industry and the general public which activities are permitted in the area. Unfortunately, there is already considerable resource development in areas for which plans are not yet prepared. For example, little of the area in northern Alberta that has recently been committed to forestry operations is covered by completed integrated resource plans.

In theory, all government agencies with a direct interest in the management of Crown land or water participate in the planning process, as well as some representatives of the public. In practice, however, those agencies outside of the Department of Forestry, Lands and Wildlife often have their own planning processes and their participation in integrated resource planning is incidental. Other departments and special-interest groups can circumvent the planning team and influence the final plan at senior government and political levels. This undermines the value of the current integrated planning approach.

Chapter Four

Interactions With Other Land Uses

The decline of the wildlife resource is a result not of competition for the resource itself, but rather of competition for the land base, over which wildlife management agencies have exercised little influence.

Agriculture Industry

The expansion of agriculture has been the greatest force behind large-scale habitat destruction in Alberta. The emphasis on "intensified industrialization of Prairie agriculture" since its inception a century ago has been a "sure formula for the destruction of wetlands, the clearing of woodlands, the abuse of marginal lands, the deterioration of soils" (Rowe 1987b: 129) in the best agricultural areas of the province. This is why a large number of the species and habitat types normally found in the prairie ecoregion, where agriculture dominates, are endangered and threatened. Cultivation of prairie grasslands for grain production and cattle grazing have transformed much of these regions. Thousands of hectares of wetlands have been drained to bring more land into crop production at the expense of our waterfowl populations.

Agriculture on Private and Public Lands

It is predominantly private land that is farmed, although a considerable amount of Crown land is available through grazing leases and permits (2.3 million hectares), cultivation permits, and other dispositions. In the White Area of the province (see Figure 3), 83 percent of the land base is privately owned. Management of the landscape is thus out of the hands of government agencies and in the hands of the landowners. Wildlife agencies have to gain the cooperation and support of the landowners to do any meaningful habitat management. Some of the programs aimed at improving wildlife management on private lands were described in Chapter 3.

Parcels of Crown land in the White Area are usually allocated to a single land use, often cattle grazing. Full utilization of the available forage is encouraged, with leaseholders losing the right to hold leases if the maximum number of cattle is not grazed. Such heavy grazing leaves little of value for wildlife when the cattle leave the pasture (Glasgow 1982).

The government's interdepartmental referral system sometimes makes minor modifications to the conditions of leases that benefit wildlife. The forage can be managed for both domestic and wild animals through rest-rotational grazing plans (Glasgow 1982). This scheme is now being used on several provincial grazing reserves for which integrated resource plans are in place.

Conversion of Marginal Lands

Agriculture in Alberta began on the better agricultural lands, generally classified as Classes 1, 2, and 3 in the Canada Land Inventory (CLI). After most of these lands had been developed, there was pressure to develop some of the poorer agricultural lands (CLI classes 4, 5, and 6). Many government programs were designed to develop these marginal lands for agriculture. Taxpayer subsidies and grants have been available to landowners or municipalities for activities such as:

- clearing land of any quality (including muskeg) for farming
- converting native rangeland to "improved" pastureland
- channelizing (dredging and straightening) streams
- draining wetlands
- backsloping roadsides for haying.

Strong pressure to cultivate marginal land has also been created by the Canadian Wheat Board (CWB) quota system, which bases the amount of grain a farmer can sell to the CWB on the acreage under cultivation, regardless of the productivity of that land. This encourages farmers to clear and cultivate marginal farmland in order to increase their quotas. Much of this marginal farmland would have considerable value as wildlife habitat if left uncultivated. The CWB is currently considering changes that will eliminate the acreage basis of its quota system.

Together, these government programs have led to the loss of thousands of parcels of important wildlife habitat in agricultural areas. This problem has been recognized and steps are slowly being taken to reverse this trend. The Prairie Farm Rehabilitation Administation (PFRA) has proposed a program to take marginal cultivated land out of annual crop production (Chambers 1989). The Permanent Cover Program will offer incentives to farmers to seed these lands to a permanent cover of grasses and/or trees.

Impacts on Fisheries

Water quality in agricultural areas is affected by surface runoff and, in parts of southern Alberta, **irrigation return flows**. Nutrients in the form of chemical fertilizers and runoff from feedlots can stimulate aquatic growth to the benefit of the fish, but excessive amounts can pollute, depleting the oxygen supply and killing the fish.

Irrigation return flow — Surface water collected from irrigated fields and returned to the source river or reservoir.

The irrigation network in the south has created 324 square kilometers of fish-producing waters (Glasgow 1982). However, protection for this fishery is not guaranteed, because the role of the canals, reservoirs, and so on as habitat is subordinate to other uses, such as irrigation and domestic water supply. Herbicides are applied to kill vegetation in irrigation canals with little consideration given to impacts on fish. Taking water from canals and natural streams for irrigation during droughts or when water levels are low competes directly with the streamflow requirements of fish. Minimum streamflow requirements are being identified for major fish species. Alberta Environment may use these to allocate water among the various users. But the needs of the fish community are unlikely to be met unless they are given greater priority in the future than they have been in the past.

In the foothills, free-ranging cattle trample the banks and beds of rivers and streams. This has led to increased erosion, sediment loading, and destruction of riparian vegetation along important fish-bearing streams. A streambank fencing program has reduced some of the problems on some streams. This program is funded by Alberta sportsmen through the Buck for Wildlife program.

Public Access to Agricultural Land

Public access to private land for viewing wildlife, hunting, or fishing relies on the good will of the landowner. In some areas, public access has been restricted. Several government programs have addressed this problem with varying degress of success. The "Use Respect" program provides signs for landowners who allow public access to their land, encouraging recreationists to respect the property they are on. A Buck for Wildlife program has improved access for anglers in return for livestock fencing along streams and provision of livestock watering areas.

A more controversial problem develops when public access to Crown lands is restricted.

Holders of grazing leases have been able to restrict public access to their lease area, but the legal authority for this has been disputed (Scammell 1986). Many of these lease areas have good recreational value and this has led to conflicts between recreationists, leaseholders, and government agencies.

Wildlife Damage

Waterfowl damage to grain crops became a source of wildlife-farmer conflict when stooking and threshing were replaced by swathing and combining (Gurba and Neave 1973). Crops in the northern Peace Country are heavily damaged because the later harvest coincides with the autumn waterfowl migration. A compensation program for farmers with waterfowl-damaged crops began in 1964, funded from the sale of wildlife certificates to Alberta hunters. The compensation was usually equivalent to about 50 percent of the market value of the lost yield. The federal government, which plays a major role in waterfowl management, later joined this program, providing half of the required funding. In 1977, the cost of this program reached $1.5 million.

As the cost of compensation rose, many methods for reducing waterfowl damage were tried and several were found to be economical. Cannons and scarecrows help to keep waterfowl off the fields. Lure crops are planted in problem areas to feed the waterfowl and keep them out of farmers' fields. Barley is spread at feeding stations along lakeshores in areas of high waterfowl damage. Federal and provincial governments share the cost of this program equally.

Waterfowl are not the only wildlife that conflicts with agriculture. Large predators sometimes harass or kill livestock. Deer and elk will feed on hay and other crops. A problem wildlife damage compensation program began in 1973 (Gurba and Neave 1973) to compensate full-time producers for 80 percent of the value of damaged crops, beehives, and livestock. Means of preventing this wildlife damage, such as fencing to exclude deer and elk, have shown some success. Predators can be discouraged by baiting them with a carcass that has been chemically treated with a nauseating substance. Landowners are allowed to kill predators such as wolves and coyotes, and problem bears are sometimes relocated by Alberta Fish and Wildlife Division staff.

Beavers can cause problems for farmers, especially in the aspen parkland region. The ponds created by beaver dams sometimes flood land the farmer needs to produce crops. Many rural counties have beaver control programs for destroying dams and trapping out the beaver. In one area of extensive beaver activity, the counties were unable to control the beaver and had resorted to removing vegetation and channelizing streams to solve the problem (Rippen and Mills 1989). To prevent further habitat loss and provide a more satisfactory solution, the Alberta Fish and Wildlife Division has begun a proactive beaver management program in those counties, to control the beaver population and compensate landowners if they retain some wildlife habitat and accept a certain amount of beaver damage (Rippen and Mills 1989).

Agricultural Chemicals

Modern agriculture relies heavily on chemicals to enhance crop growth and combat weeds, insects, and disease. Farmers are pressured to use chemical fertilizers, insecticides, herbicides, and fungicides. Government agriculture agencies and chemical manufacturers are influential advocates of using chemicals to improve productivity. Government subsidies are often available to defray some of the cost of these agricultural chemicals. This can lead to excessive use of these chemicals, rather than judicious application.

When more fertilizer is applied than the crop can use, the excess often ends up in the surface runoff and irrigation return flows. This enriches surface waters and leads to **algal blooms** and oxygen deficits. Excess pesticides can also end up in rivers and ponds. Pock-

Algal bloom — A population explosion of tiny aquatic plants.

ets of natural habitat may also be affected by these chemicals, either through drifting spray or blowing soil. Non-target organisms are affected by broad-spectrum pesticides and any natural balance that exists may be disrupted.

Linear Facilities for Natural Resource Development

Most resource industries rely on linear facilities to develop and service their resource. Linear facilities include roads, seismic lines, pipeline rights-of-way, cutlines, and powerlines. The oil, natural gas, and timber industries in particular have created extensive networks of linear facilities in wilderness areas. This creates environmental, wildlife, and people management problems. Public access to wildlife habitat via this extensive road and trail system increases pressure on wildlife populations from hunters, anglers, and trappers. Along with an expanded legal harvest comes the illegal harvest by poachers. Recreationists on foot, horseback, or motorized vehicles also take advantage of these new access routes. This can lead to increased disturbance of wildlife and soil erosion in heavily used areas or on steep terrain. Tons of sediment wash into the streams crossed by these linear facilities as a result of failure to control erosion effectively, to reclaim disturbed areas quickly, and to avoid other poor construction practices.

The Alberta Forest Service has published guidelines for most exploration and development activities, including road construction and stream crossings (Forest Land Use Branch 1984; Fisher 1982). Facilities in key wildlife areas are now designed with mitigative measures. For example, "doglegging" of seismic lines at road crossings restricts the line of sight from the road. Gates and signs are installed in some critical wildlife areas, but maintaining and monitoring these gates is difficult. Piled slash is also used to block access in forests. Closing these access routes sometimes becomes a political issue, as recreational user groups lobby to keep roads and rights-of-way open. Alternatives to closure, such as manipulation of hunting seasons, have been suggested, but would require more enforcement and would have little influence on illegal poaching or native harvests.

Energy Industry

The development of Alberta's fossil fuels — oil, natural gas, and coal — has contributed greatly to Alberta's economic growth during the past three decades. Hydroelectric power has also been developed as an energy source. These developments have had many direct and indirect impacts on wildlife.

Oil and Natural Gas

Oil and natural gas are found in all regions of the province. Exploration and development of these resources disturbs habitat locally. This is especially the case for heavy oil development, which requires steam-injection wells in addition to oil-extraction wells. The sheer size of the petroleum industry in Alberta has led to an extensive cumulative impact on wildlife. Seismic lines, well sites, pipelines, pumping stations... many of these facilities are located in wilderness regions. As described above, many of these developments allow a variety of different user groups access to previously inaccessible wilderness. In addition, the petroleum industry is the major source of acid- forming emissions in Alberta. It accounts for 81.5 percent of sulphur dioxide and 38 percent of nitrogen oxide emissions in the province (Legge 1988). Although Alberta soils are fairly well buffered, there are areas sensitive to acidification. Acid deposition has been implicated in reduced forest growth and, specifically, in reduced photosynthesis in trees near gas plants (Mayo 1987). Thus acid deposition will affect wildlife habitat.

Oil spills, gas well blowouts, and similar catastrophic incidents can kill animals and cause serious pollution. To date, this has not been a major problem.

Mining

Coal is mined in both the prairie and foothills regions of the province. Some of the impacts of these operations have not been anticipated because project-by-project assessment does not account for cumulative effects of all resource development in an entire river basin. Open pit mines in the foothills have disrupted surface and subsurface water flow to the extent that flow regimes of some streams have changed. Mining also introduces sediment into rivers and streams. Settling ponds are used to reduce the suspended solids entering the watercourse; however, they have not always effectively protected the aquatic habitat in some watercourses, such as the Lovett River. Fish communities are especially sensitive to sedimentation.

If mining expands into sensitive terrain, such as sub-alpine and alpine habitat, reclamation will be more difficult. More research will be needed on reclamation techniques for such areas. Innovative reclamation projects could be designed to benefit wildlife. Research at the Cardinal River Coal mine, south of Hinton, indicates that mountain sheep will use the high walls of an abandoned open pit as escape terrain. Reclamation plans propose to maintain some of the high walls and to provide feeding areas and travel corridors nearby.

Oil sands in the Fort McMurray area are mined from huge open pits. The mining and refining operations in this region have contaminated the Athabasca River and its receiving body, Lake Athabasca. Oil sands plant malfunctions have resulted in levels of oil, grease, and phenolics exceeding the allowable levels by 10,000 times (Environmental Resource Centre n.d.). This pollution tainted fish in Lake Athabasca and the commercial fishery was temporarily closed.

Hydroelectric Power Generation

While dams for hydroelectric power do not consume water, they nevertheless have significantly affected fisheries and other ecosystems in Alberta. Aquatic communities in the mountains and foothills are adapted to a natural flow regime that peaks in early summer and is lowest in winter. Hydroelectric dams, on the other hand, are often operated to reduce variability of the downstream flow: spring flooding is reduced and winter flows are increased. Dams can also impede fish migration unless properly designed fish ladders are in place. Flooding of terrestrial habitats, such as the river valleys which provide wildlife with essential food and shelter, and important travel corridors, is another impact of damming rivers.

The W.A.C. Bennett Dam on the Peace River in British Columbia demonstrates the havoc that can be brought on wildlife and wildlife resource users when such peaks in flow are eliminated. Downstream at the Peace-Athabasca Delta in northern Alberta, residents of Fort Chipewyan trapped approximately 200,000 muskrat annually. After the dam was built, this harvest was virtually eliminated, along with the commercial fishing industry of the Delta, the waterfowl produced on hundreds of small basins, and a large expanse of bison habitat (Smith 1986). Attempts to restore the natural hydrologic regime with weirs (dams) on outlet channels have succeeded only partially. Small, managed marshlands are now seen to be one way to mitigate the loss of delta habitat.

Dam operations affect another biological community — the cottonwood forests along prairie rivers. Approximately 60 percent of bird species in the Great Plains depend on riparian cottonwoods during migration (Bradley 1987). Periodic flooding of cottonwood forests favors seedling establishment, and this natural cycle is lost downstream from hydroelectric dams. Mitigative measures such as planting and watering are costly.

Some hydroelectric dams are operated to meet daily peak power demands. The result is large daily fluctuations and rapid changes in current velocity, to the detriment of most fish species. This practice has seriously impoverished the aquatic community in the Kananaskis River system.

Dams in Alberta's foothills convert stretches of cold-water rivers to warmer reservoirs. Warm-water fish species such as northern pike, lake whitefish, and suckers benefit at the expense of the highly valued cold-water species, such as trout and mountain whitefish. Biologists have documented reductions in the size and number of trout as a result of dams on the Bow River system (Prescott 1985).

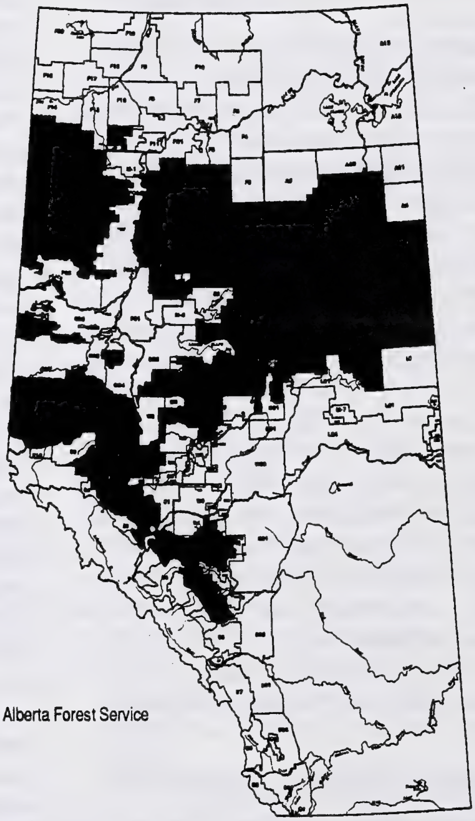
Forest Industry

The year 1988 saw a major expansion planned for pulp and timber operations in the forests of Alberta. Over one-half of the Green Area is now allocated to timber and pulp production (Figure 4). With the construction and expansion of pulp mills and sawmills will come new access routes, habitat changes, and impacts on water quality. Yet effects on wildlife and mature forest habitat were not studied prior to these commitments. Integrated management of our forests will not be sucessful unless all forest resources are understood and managed together.

Timber Harvesting

The extensive habitat modification that results from harvesting timber benefits some wildlife species and is detrimental to others. Government guidelines describe normal harvesting practices and identify environmental factors to consider when planning logging activities (Alberta Forest Service 1986). For example, undisturbed buffer zones are normally required adjacent to permanent rivers and streams. Slash and debris are supposed to be kept out of all watercourses. Steps to minimize soil erosion are also described. Field inspections by government personnel have been relatively successful in ensuring that these guidelines are followed.

Forestry companies submit harvesting plans to the provincial government for approval. In these plans, roads and cutblocks are laid out and harvesting schedules are described. The Alberta Fish and Wildlife Division provides some information about important wildlife species, key habitat, and major management requirements at least five years in advance of harvesting (Alberta Forest Service 1986). Annual harvesting plans are also reviewed by regional biologists. Because staff and resources in the Fish and Wildlife Division are limited, information about area wildlife is some-



Source: Alberta Forest Service

Figure 4. Existing and Proposed Forest Management Agreements January 1, 1989

times inadequate. Furthermore, applications for timber dispositions and other items referred to Alberta Fish and Wildlife Division for comment are handled in order of priority. Not all applications are reviewed in detail. This is a growing concern as cutbacks to the Fish and Wildlife Division have coincided with a large expansion in Alberta's forest industry.

The standard harvesting method used in Alberta is clearcutting in which large blocks of timber are harvested by cutting or knocking down most of the trees. This is an efficient logging method, well suited to large machinery. It also creates favorable conditions for regenerating shade-intolerant species, such as lodgepole pine.

Clearcut harvesting is undertaken in two stages. Half of the area is harvested and replanted, while the remaining timber is harvested only after the regenerated trees in the first cutblocks are at least two metres high. The forest that results following the first pass of a clearcut harvest is a mosaic of cutblocks and **leave blocks**. This provides a variety of habitat types, suitable for some wildlife species. Deer and elk can feed on early successional vegetation in the cutblocks, while the adjacent older stands can provide shelter. Similarly, grizzly bears will use cutblocks when the regenerating vegetation has reached a certain height, provided there is no human disturbance (Horejsi 1985).

Leave blocks — Areas of trees left standing when cutblocks are harvested in a patchwork pattern.

The habitat created by the second pass of harvesting is of much lower quality. The trees in the original cutblocks may be only two metres high when the remaining mature stands are harvested. The resulting landscape has limited value for a number of wildlife species. The most obvious example is the woodland caribou, whose critical winter range consists of some coniferous forests over 150 years old (Snyder 1987). Lynx, marten, weasel, and squirrel also require mature forests. These species would benefit from a harvest in three stages instead of two. Alternatively, the new forest growth in the cutblocks should be allowed to grow to eight metres before the leave blocks are harvested. Selective harvesting, in which selected trees or groups of trees are harvested, may also benefit wildlife. Under a selective harvesting regime, there is a mixture of age classes throughout the forest. Mature forest communities are maintained and there are fewer sites in early stages of succession (Thomas 1979). On the other hand, selective logging might disturb the forest more frequently, a disadvantage for sensitive species such as moose.

Cutblock size and shape and site preparation for reforestation are also important. Long, narrow, irregularly shaped blocks are generally better for wildlife than uniform square blocks. A long-term study in the Hinton area found that limited clearcutting can benefit elk and deer when cutblocks are interspersed with stands of uncut forest that are at least 100 metres wide, if human disturbance can be restricted (Stelfox 1984). **Scarification** is commonly used to prepare sites for replanting and can reduce the value of the regrowth for wildlife (Stelfox 1984). New scarification methods, such as patch scarification, may be more beneficial.

Scarification — The use of heavy machinery to break up the ground surface and expose the mineral soil prior to replanting.

Current harvesting practices remove dead and dying trees along with merchantable timber. However, many species of birds, insects, and small mammals require dead, standing trees or "snags" for nesting or feeding (Thomas 1979). Woodpeckers, hawks, owls, and even certain ducks such as goldeneye and bufflehead nest in tree cavities. Clearcut harvesting greatly reduces the number of snags available to these species. More snags should be retained in logged areas.

Selective logging may be practical where the terrain is level and machinery can be maneuvered without damaging the understory. Harvesting the large, top-quality trees in this way may suit sawmills that produce lumber. But for pulp production, an operation in which the quality of the fiber is more important than tree dimensions, clearcutting may be more practical. Clearcutting tends to remove more of the smaller trees over more of the logged area and has a more significant effect on regional wildlife habitat than selective logging does. Thus, from a wildlife perspective, it is very important that the pulp industry incorporate some selective harvesting or modified clearcutting into its harvesting regime.

Forest Wetland Drainage

As the forest industry expands in the northern part of the province, wetland drainage is being considered to increase timber production. Experience in eastern Canada and Europe shows that ditching and draining forested wetlands can lower the water table and increase tree growth rates. Of Alberta's 13 million hectares of peatland, about 4 million are considered suitable to drain for timber production; experimental drainage studies are underway in Alberta (Hillman 1987).

Large-scale drainage in northern Alberta, which would involve extensive networks of ditches, lower water tables, and changes in vegetation, is bound to have an impact on wildlife habitat.

Pulp Mill Effluent

In 1988, the federal government ordered testing of waters around all pulp mills following evidence in the United States that linked chlorine bleaching of kraft pulp to the presence of dioxins in fish. In Alberta, dioxins were found in concentrations up to 17 parts per trillion in fish downstream from pulp mills on the Wapiti and Athabasca Rivers. Chlorophenols and other chemicals have also been detected in fish from the vicinity of Alberta pulp mills (Alberta Environmental Centre 1987). The effects of other chlorinated organic compounds have not yet been documented.

With at least four bleached kraft pulp mills planned for the Peace and Athabasca Rivers, the quality of the effluent being discharged into Alberta rivers must be monitored and controlled. In 1988, the Alberta Minister of Environment announced new standards aimed at reducing the amount of chlorine used and subsequent discharge of dioxins from these mills. More recently, a federal-provincial review board has been established to hold public hearings on the cumulative effects of numerous pulp mills on the Peace and Athabasca Rivers.

Herbicides in Forestry

Although aspen is becoming a commercially important species, coniferous trees like pine and spruce are still essential to the forest industry. Competition from aspen and grasses has presented a major problem to the industry in trying to reforest some cutover sites with coniferous trees. Forestry companies are seeking permission to use herbicides to control this competition until the pine and spruce are well established.

The vegetative structure of the community will undoubtedly change with herbicide use, although the extent and duration of the change will depend on factors such as the chemical used, time of year, and number of applications. Currently, one or two applications are foreseen over an 80-year rotation period, unlike the annual applications in agriculture. However, cultivated land is dedicated entirely to crop production, whereas forests are used for a wide variety of benefits. Little good information is available regarding changes in vegetation expected from operational forestry spraying in Alberta. Reliable information is required to predict effects on the ecosystem and the wildlife that depends on it. Opponents of forestry spraying argue that forest management could be modified and other methods of vegetation control could be used. Some research is underway in the province into the economic and environmental outcome of chemical and alternative methods of vegetation control.

Effects on Trapping

Forest habitat is a major source of fur-bearing animals for the trapping industry. The habitat modification that results from timber harvesting and reforestation has a major impact on the trapping industry. Because many important furbearers require mature forests, which are also important for timber, there is a direct conflict between trapping and forestry operations.

If local trappers are consulted during the development of harvesting plans, some of the conflicts between these two industries can be resolved. The petroleum industry has developed a system of compensation to trappers for loss of income from exploration and development activity. The Alberta Trappers' Association has been trying to negotiate a similar arrangement with the forest industry without success. Perhaps government intervention will be needed to resolve this issue.

Outdoor Recreation and Tourism

Alberta's varied landscape, ranging from desert-like badlands to lush mountain forests, is an attractive setting for recreation and tourism. Protection and management of this natural heritage can have great benefits for wildlife. For example, Alberta's mountain national parks, Jasper, Banff, and Waterton, are international tourist attractions as well as important wildife sanctuaries. As well, Banff and Jasper National Parks are World Heritage Sites.

Although Alberta has numerous world-class wildlife features, many in beautiful natural settings, Alberta's wildlife tourism is treated with "benign neglect" compared with neighboring jurisdictions (Prism Environmental Services Ltd. 1989). Much needs to be done to take advantage of this valuable natural heritage.

Annual revisions to hunting and fishing seasons and regulations reflect new information on population numbers and user demands. These changes can pose a problem for guides and outfitters who book their clients one or two years in advance. Changes in opening and closing dates and closure of hunting or fishing seasons can disrupt holiday plans and discourage tourist visits. Such effects deserve greater consideration when regulations are revised.

The infrastructure needed to support tourism and recreation, such as roads and accommodation, must be developed with sensitivity to local wildlife. Campgrounds and primitive tourist facilities are usually placed in natural settings. While these facilities displace relatively little wildlife habitat, the ensuing traffic, off-road vehicle use, and boating activity can affect a large area.

The growing popularity of helicopter sightseeing in the mountains has led to harassment of mountain sheep, mountain goats, and elk for the pleasure of the sightseers. This activity is largely unregulated outside of the national parks. Helicopters are also used to transport fishermen to high mountain lakes, which adds considerable fishing pressure to these relatively unproductive waterbodies.

Legislation can control the impacts of recreational activities. Forest Land Use Zones can be established to restrict motorized vehicles on Crown lands. Boating restrictions under the Navigable Waters Act protect nesting colonies of cormorants. As well, integrated resource plans indicate appropriate locations for tourist facilities. Nevertheless, intensive or large-scale tourism developments can negatively affect wildlife, and citizen concern for wildlife has effectively stopped some proposed tourism developments (Pachal and Smith 1986).

Chapter Five

Achieving Sustainable Use

Since the arrival of the first settlers, agricultural expansion has consumed much of the wildlife habitat found in the prairie region. During the past 15 years, wildlife managers in Alberta have had to contend with some of the most intensive resource exploration and development on the North American continent (Stubbs and Markham 1979). Exploration and development of oil and natural gas continue to spawn extensive road construction, seismic activity, pipeline construction, and well construction. Today, a large expansion of timber harvesting in northern Alberta is underway.

In addition to this destruction and modification of natural habitat, consumptive uses of our wildlife, such as hunting, fishing, and trapping, have placed increasing pressure on animal populations. In the future, non-consumptive uses such as viewing and nature studies may add to the pressure on wild animals and plants.

Are we managing our landscape in a manner that will sustain a healthy wildlife resource? Achieving sustainability means:

- *sustaining the resource* — protecting species and ecosystem viability and, as much as possible, the natural distribution of wildlife throughout the province, and
- *sustainable use* — providing opportunities for consumptive and non-consumptive use at levels that do not threaten the long-term security of the wildlife.

Species and Ecosystems

The "key species" and "critical wildlife habitat" approach to wildlife management may have been adequate until now. However the pressures on our wildlife resources are increasing. Species that are not considered important today can still fall through the cracks with a species-oriented approach. If we concentrate on a select group of species, others may end up on the list of threatened or endangered species. A more holistic approach to managing the landscape is needed.

For those species that do become endangered, recent success stories offer some hope. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recently took the wood bison off the endangered species list (Environment Canada 1988). The whooping crane population, once on the brink of extinction, is expected to reach 150 birds by 1990.

Programs for endangered species have greatly increased public awareness about the plight of wildlife and have stimulated much landowner and government co-operation. The high-profile burrowing owl and swift fox projects in southern Alberta are good examples. Nevertheless, these programs are aimed at correcting failures of our current system to conserve these species, not at preventing such failures in the first place.

Opportunities for Sustainable Use

Providing opportunities for both consumptive and non-consumptive use is advocated in the Fish and Wildlife Policy for Alberta and has been the object of a great deal of planning effort since the policy was adopted (Alberta Fish and Wildlife 1982). Whether the government's declared population goals are achievable in the face of continuing loss of habitat, illegal hunting, predation, and declining populations remains to be seen.

The demand for certain species will continue to grow. How will we meet our demands for wildlife in the future? Sportfishing is placing greater pressure on our fish populations. Viewing and other non-consumptive uses are on the increase. Can our landscape be managed to produce sufficient wildlife? To what extent should wildlife be produced on farms and in hatcheries for release to the wild? The supply of wildlife is limited and wildlife managers are going to have to look more closely at managing the demand for wildlife and not just the supply.

Wildlife management is at a turning point. Traditional methods may not be adequate to meet the growing pressures on our wildlife resource. Wildlife management is no longer the sole domain of biologists. A broader training in ecosystem processes and communicating with the public will be needed. The agencies responsible for wildlife management will have to change to reflect this new direction.

A Vision for Wildlife

A vision is needed to guide wildlife management in the future. We need a clear set of objectives against which we can measure our progress. These objectives must be bold. For too long, the wildlife resource has been placed on the defensive. Other resource developments are approved and then the wildlife manager has to see what can be salvaged with the remaining fragmented landbase. "The primary consideration of the Government is to ensure that wildlife populations are protected from *severe* decline and that viable populations are maintained" (Alberta Fish and Wildlife 1982: 8; emphasis added). This is not a bold objective. We cannot be satisfied with simply stopping further losses. We must regain some of the inventory that has already been lost.

The people of Alberta should contribute to the development of this vision for wildlife. It is not up to one group of politicians, a handful of wildlife managers, or one interest group. All Albertans benefit from our wildlife resource and the contribution of wildlife to our quality of life is very important. The Alberta Conservation Strategy can provide a focus for such a discussion, leading to a consensus on a sustainable future for Alberta.

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Personal Communications

Andrews, B. Director, Wildlife Management Branch, Alberta Fish and Wildlife Division. Edmonton.

Moyles, D. Regional Wildlife Manager, Alberta Fish and Wildlife Division. Peace River.

Stevenson, B. Head, Commercial Wildlife Section, Alberta Fish and Wildlife Division. Edmonton.

Voaklander, O. Business Development Officer, Industry and Business Development Division. Travel Alberta. Edmonton.

Zelt, K. Head, Commercial Fisheries Section, Alberta Fish and Wildlife Division. Edmonton.

Appendix A

Members of the Renewable Resources Sub-Committee

The following people served on the Renewable Resources Sub-Committee at some time during the preparation of this discussion paper.

Mr. Don Appleby — Cold Lake Community Advisory Committee
Mr. Nelson Barber — Alberta Trappers' Association
Dr. Bill Cox — Alberta Veterinary Medical Association
Mr. Hugh Craig — Western Barley Growers' Association
Dr. Bruce P. Dancik — Trout Unlimited Canada (Alberta Council)
Dr. Ted Drouin — Keyano College
Dr. David K. Elton — Canada West Foundation
Mr. Clark Fawcett — United Farmers of Alberta Co-operative Limited
Mrs. Elsie Friesen — Unifarm
Mr. Harvey Gardner — Federation of Alberta Naturalists
Mr. Tim Garner — Fairview College
Dr. Anthony Gerrow — Alberta Veterinary Medical Association
Mrs. Shirley Henderson — Alberta Association of Registered Nurses
Mr. Pat Herzog — Lethbridge Community College
Mr. Ed Kulcsar — Canadian Institute of Forestry
Mr. Elmer Kure — Unaffiliated
Ms. Adrienne Lacombe — Cold Lake Community Advisory Committee
Mr. Garry Leithead — Alberta Forest Products Association
Mr. Stacy Linington — Northwestern Fishing Co-op
Mr. Brian MacDonald — Grande Prairie Chamber of Commerce
Mr. Don Mallon — Edmonton Chamber of Commerce
Ms. Janis McLean-Hayden — Alberta Wilderness Association
Mr. Brian Meller — Lethbridge Community College
Mr. David Porter — Canadian Petroleum Association
Mrs. Maryhelen Posey — Unaffiliated
Mr. Gus Ribiero — Canadian Water Resources Association (Alberta Chapter)
Mr. Arden Rytz — Alberta Forest Products Association
Ms. Louise Sherren — Alberta Snowmobile Association
Dr. Joan Snyder — Grande Prairie Regional College
Mr. Don Stiles — Canadian Nature Federation
Mrs. Janet Walter — Unifarm
Mr. Ron Whistance-Smith — Unaffiliated
Mr. Tim Williamson — Canadian Institute of Forestry
Mr. Stan Wiskel — Western Barley Growers' Association
Mr. Jack Wooders — Alberta Trappers' Association

EEAC Liaison Members — Mr. Ian Waugh, Mr. Dan Stoker
SAC Liaison Members — Dr. Robert Swanson, Dr. W. Fuller

About Our Logo

Alberta
ENVIRONMENT COUNCIL OF ALBERTA

Over the past two decades, the logo of the Environment Council of Alberta has shown three overlapping triangles as representing the foundations of our environment: land, air, and water. These triangles also represent the three groups with which the ECA interacts: industry, government, and the public. The three triangles intersect to form a circle symbolizing the biosphere. The small triangle in the centre of the circle symbolizes these three groups joining together to work for the conservation of our environment.

In 1980, the overlapped triangle motif was used by the World Conservation Strategy to represent the three primary objectives of that document. The Alberta Conservation Strategy incorporated the triangle motif into its logo by overlaying the WCS triangles onto a three dimensional outline of Alberta. This combination of triangles with the readily identifiable outline of provinces, nations, and regions has marked conservation strategies around the world.

N.L.C. - B.N.C.
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